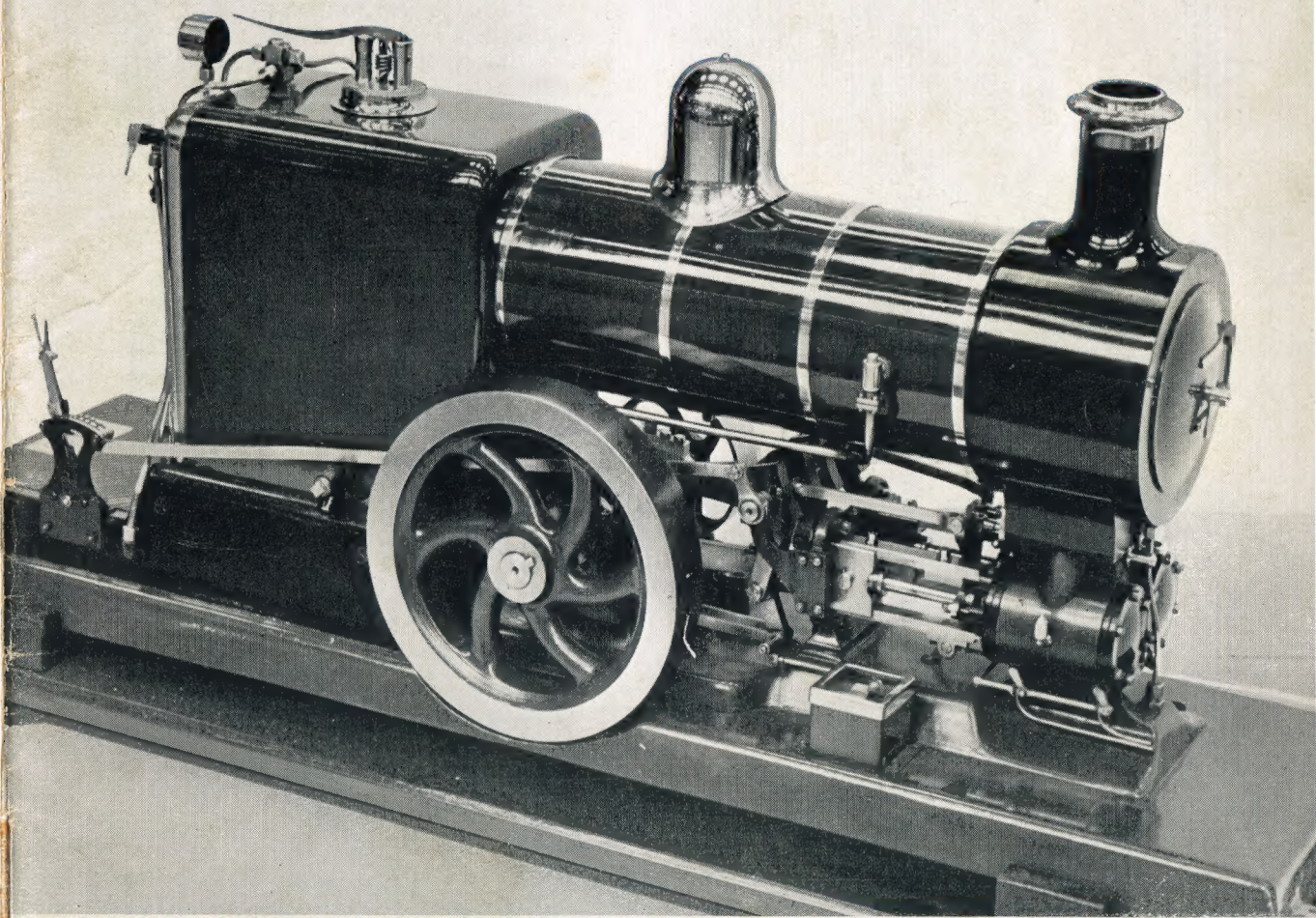


THE MODEL ENGINEER



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- L.B.S.C.'s "NETTA" — VALVE GEAR FOR 3½-in. GAUGE ENGINE
- SMALL TWIST DRILLS — A SIMPLE SHARPENING DEVICE
- BORING ATTACHMENT FOR THE LATHE ● READERS' LETTERS

OCTOBER 7th 1954
Vol. III No. 2785

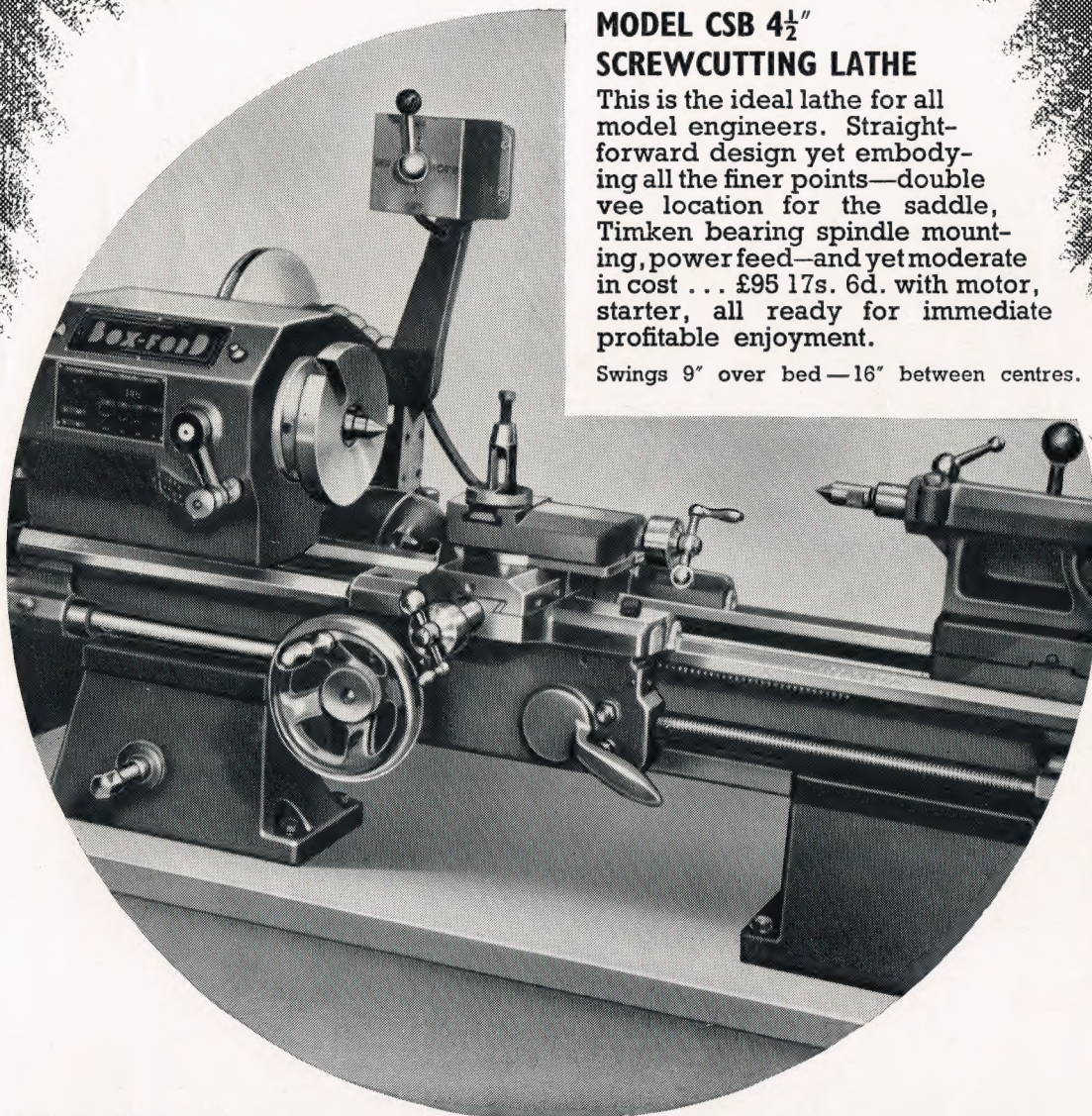
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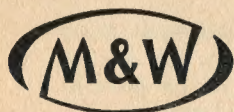
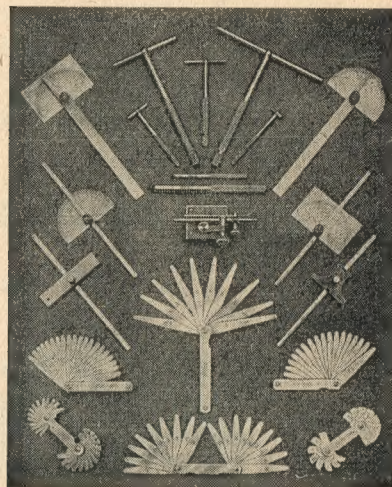
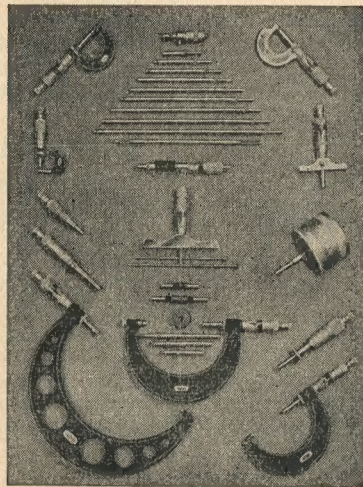
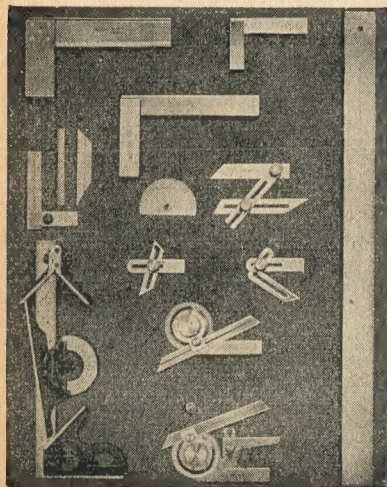
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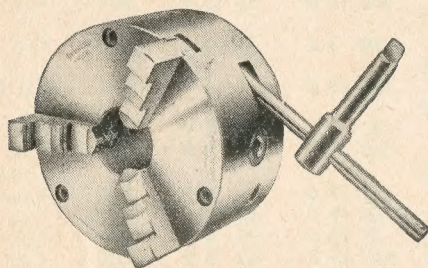
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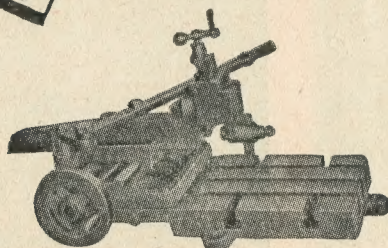


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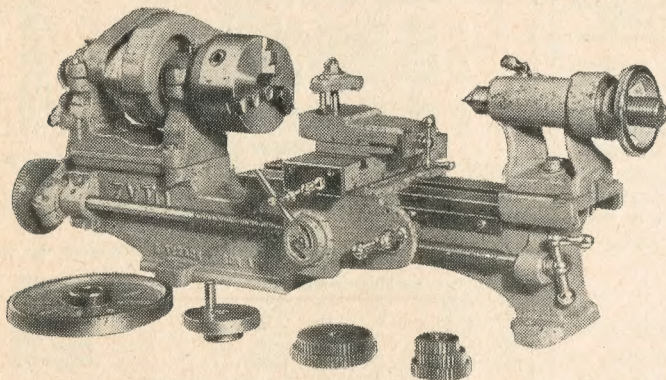
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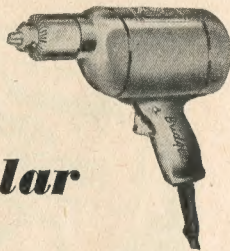
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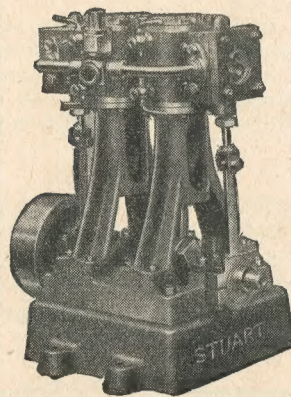
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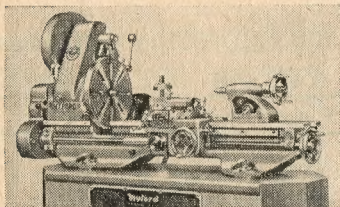
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THE MODEL ENGINEER

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EVERY THURSDAY

Volume III - No. 2785

OCTOBER 7th - 1954

SMOKE RINGS

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Our Cover Picture

The subject of this week's cover picture was illustrated in our review of models at the "M.E." Exhibition published in our August 19th issue. It is the interesting undertype steam engine made by Mr. J. E. Kelly of Chatham, and this second picture of it gives a nearer and, perhaps, clearer view of it. Several people noticed that the boiler and firebox unit and its mountings bore a striking resemblance to those of a South Eastern and Chatham Railway locomotive of the Class "E" 4-4-0 type. Mr. Kelly has stated that it was his original intention to use these items in a model of one of the locomotives mentioned, and they may be put to such a purpose even yet.

These Non-Stop "Records"

ON SUNDAY, September 19th, at the Blackgates track of the West Riding Small Locomotive Society, Mr. A. Balmforth's 7½-in. gauge 2-6-4 tank locomotive made a nonstop run of 100 miles in just under 10½ hours. This, of course, is some 30 actual miles better than the previous "non-stop record" of 70 miles, run a few weeks earlier, by a 3½-in. gauge engine at Chingford. But what "record" has Mr. Balmforth's engine actually broken? Or, to put the matter another way, was not the performance of his engine little better than half that of the 3½-in. gauge engine, proportionately?

Consider the distances and times achieved by these two engines, and what they mean when converted to the equivalent full-size quantities. The 3½-in. gauge engine ran the equivalent of, approximately, 1,120 miles at an average speed of about 110 m.p.h.; the corresponding performance of the 7½-in. gauge engine was, near enough, 800 miles at an average speed of 80 m.p.h., which, on the face of it, is much less meritorious. Therefore, what "record" has been achieved, or broken?

Now that these small-gauge, long-distance runs have become a sort of "fashion," others, presumably, will be attempted in the future. But it seems that, unless all the factors concerned are to be duly taken into account and the results assessed on some common basis, nobody can say what is, or is not, a "record." So far, the results teach nothing except that the small steam locomotive has much power of endurance; of what use is that knowledge to anyone? Does it help the live-steam fraternity in any way? With all due credit to the engines and their drivers, there must be a great deal more thinking done yet, and far wider agreement on the assessment of results, before anything like an official "record" can be decided. So far, the only tangible result of any of these long, non-stop runs has been the publicity gained; and some of our readers have expressed doubts as to whether it is publicity of the right kind. Unless a much more satisfactory method of organising the data

obtained from these events can be universally agreed to, there is a grave danger that the live-steam locomotive hobby will go right off the rails, in more senses than one.

What is Their Story?

DURING THE fifty-five years, and more, that have elapsed since THE MODEL ENGINEER was first published, the number of models that have been built by its readers must amount to hundreds of thousands; and every year that passes adds some few hundreds more to the ever-increasing total. What becomes of all these models? This is a question that is bound to be asked, at least once, each year by visitors to the "M.E." Exhibition and, no doubt, to other exhibitions.

A complete answer to the question is not possible, simply because so many examples of beautiful craftsmanship, after being shown at one, two, or possibly more exhibitions, just disappear and are never seen again. What happens to them is a matter for conjecture. For others, however, several different "fates" or "destinies" can be recorded. One or other of our technical museums acquire a select few, by purchase or bequest, which ensures that such models will not be entirely lost sight of in the future; and for really accurate, representative models of almost any type, this is the best fate that can befall them.

Then there are many models which remain heirlooms of a kind, being passed on from generation to generation in the families of the builders. In such cases, there is the danger that, in course of time, the value and interest of a model may fail to be appreciated by some succeeding generation, with the result that the model may be either consigned to a lumber-room, or even given to children to play with and destroy. In some cases of this kind, rescues of valuable models have been effected just in the nick of time to prevent total destruction.

These are the stories to be told of the great majority of those models that do not disappear entirely from sight; and, presumably, this state of affairs will endure for so long as model engineering remains a hobby.

Small-scale Locomotives at the "M.E." Exhibition

By G. M. J. Chesmore

WE can take it for granted, I should think, that the exhibition stewards were more than once confronted with the casual visitor who wanted to know (without having given much thought to the matter) which was the most outstanding model in the show. Quite apart from the difficulty of judging oranges against bananas, this is what, in modelling circles, is known as a leading question; and the answer would most probably be governed by personal taste rather than by orderly examination (judges excepted !)

If someone had crossed similar swords with me over the Class "B" exhibits, however, I would have replied, without hesitation, that out of the small scale model locomotives, Mr. A. Beale of Chelmsford, Essex, had the most remarkable entry in his 7 mm. scale "S160" Class U.S.A. 2-8-0, which was awarded a Silver Medal.

The prototype locomotives themselves were rather remarkable machines. Imported during the second world war, they provided a striking contrast to British designs, having bar frames, off-centre safety valves set well forward and plenty of "plumbing" on show. Mr. Beale's model displayed all these points and in addition contained some particularly fine detail around the smokebox front and valve gear. Its grey matt finish, plus accurate and neat workmanship, made this one of the most

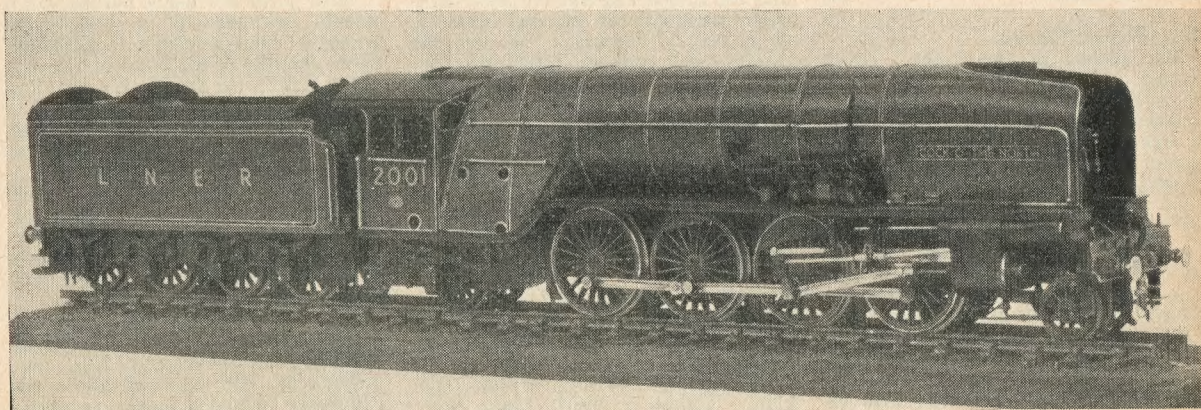


This fine "EM" gauge Southern T9 had a realistic tender load of coal

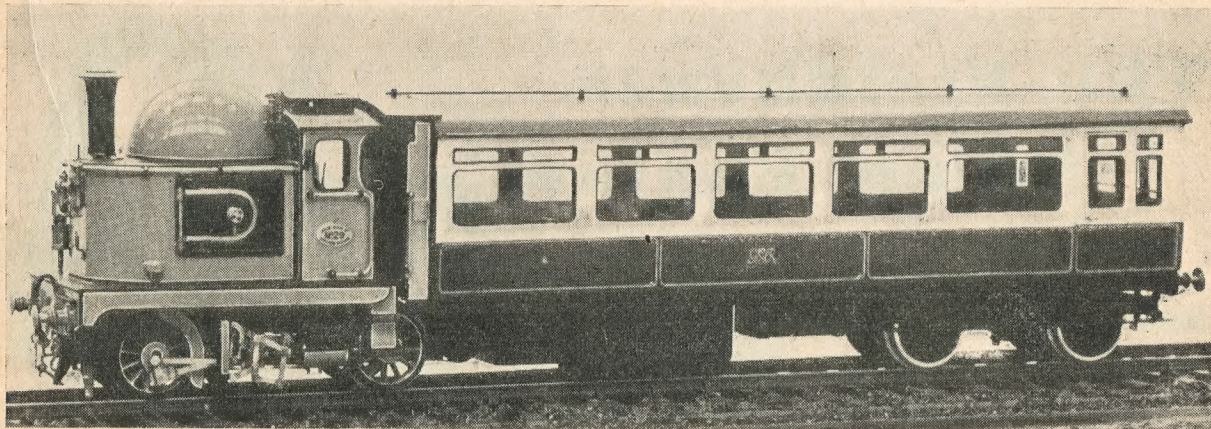
photogenic models on show and, to cap it all, I was staggered to find that it was a high-pressure spirit-fired live steam job. The working pressure is 80 lb. per sq. in. and there is a mechanical lubricator between the frames. Incidentally, I noticed that the builder had shunned modelling the prototype pattern driving wheel-centres. Even so, the normal type fitted did not somehow spoil the overall effect. But live steam! As I heard so many others saying: "If only we could see it running. . . ."

The other Silver Medallist in Class "B" was Mr. R. J. B. King of Strood, Kent, whose name by now, should be familiar to exhibition visitors. This year, the latest addition to his stud of EM gauge (4 mm. scale, 18 mm. gauge) models was an exquisite "rare bird"—a

Great North of Scotland Railway steam railcar of 1905. With the G.N.S.R. centenary falling as it did in September, this was a most timely exhibit. Looking at this model of such an obscure prototype recalled to mind the gentleman who once said, that it was just as easy to make an accurate model as an inaccurate one. He might have added "provided you have the prototype information available." I am sure Mr. King spent far more time in the research department than in the workshop. Nowadays one tends to picture a railcar as a special sort of passenger coach with an under-floor diesel engine, but this little replica took one back to the days when steam stood unchallenged and railway companies pursued the then more obvious course of taking half a locomotive, half a coach and



Mr. F. Reynolds, of Newcastle-on-Tyne, built this imposing "OO" gauge replica of L.N.E.R. "Cock o' the North," as it originally appeared



Mr. R. J. B. King's "EM" gauge G.N.S.R. steam railcar. An "unusual" model. Mr. King photo-engraved his own number-plates

joining the two ends together. In this case the spherical boiler adds to the already quaint appearance of the design which is well portrayed by a beautifully constructed model, finished with superb paintwork. You really have to see it to appreciate the effort put in by the builder.

The London North Eastern locomotive *Cock o' the North*, like No. 10000, immediately attracted the public's attention with its somewhat novel appearance and although it has now been rebuilt twice (the second time, alas, out of all recognition) the memory of its original form still lingers. Mr. F. Reynolds of Newcastle-on-Tyne won a Bronze Medal for his "OO" gauge model of the engine as it first appeared. The painting in this case has been done, very well indeed, by a commercial modelmaker.

In arranging the chassis of the engine, the builder has fitted springing to all axles, the two centre driving axles having $1\frac{1}{2}$ mm. side play so that the locomotive may traverse 3 ft. radius curves, thus avoiding unsightly flange-

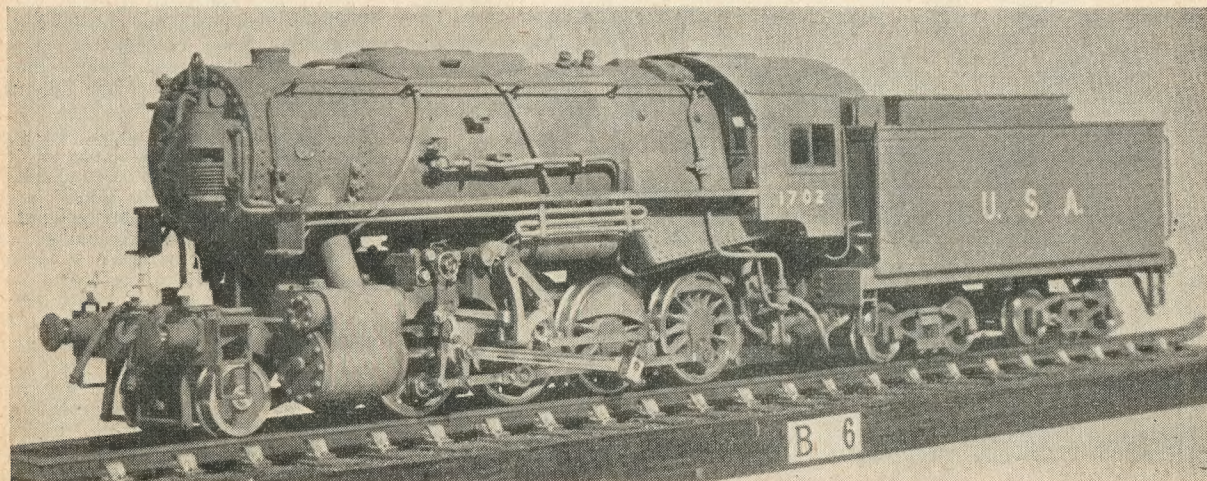
less wheels. The motor is an American Pittman D.C.71 driving the rear coupled axle through a 40:1 reduction worm and wheel. Cerrobend has been used as ballast. This metal, about the same weight as lead, and with a melting point around 70 deg. C., can be poured into convenient parts of the finished bodywork without wiping out many hours patient soft-soldering! With this combination of power and adhesion we were not surprised to learn that No. 2001 can comfortably handle 23-coach trains on the owner's layout, the load including six heavy Pullmans.

Mr. C. T. Standfast of Ilford, Essex was awarded a Bronze Medal for a very fine EM gauge Southern Railway T9 class 4-4-0 in its rebuilt condition and finished in the pre-war olive green livery with large numerals on the tender. This model, too, has additional ballast over the driving wheels—an even more desirable feature with only four "drivers." On the cab side are scale cast number plates made for the builder by Mr. Slagg and all the more prominent

controls are fitted to the backhead. The "bridge view" of the model reproduced with this article shows the very pleasing lines and forcibly illustrates how much more realistic is a model tender when it has some coal in it!

One of the many characteristic sets of passenger coaches on the Great Western is the "Toplight" series, so named by the small windows over the compartment quarterlights. When the suggestion for the production of 4 mm. scale "Toplight" kits was made to one of the model railway manufacturers, it was pointed out that by fitting various types of mouldings, truss rods and bogies it would be possible to turn out nine or ten different vehicles from four basic kits. Mr. D. E. H. Birse, also of Ilford, received a Bronze Medal for his exhibit C4, which comprised six of the possible variations made from the standard trade kits. All his coaches are fully detailed and immaculately finished in the G.W. brown and cream livery. Together they made a very fine

(Continued on page 420)



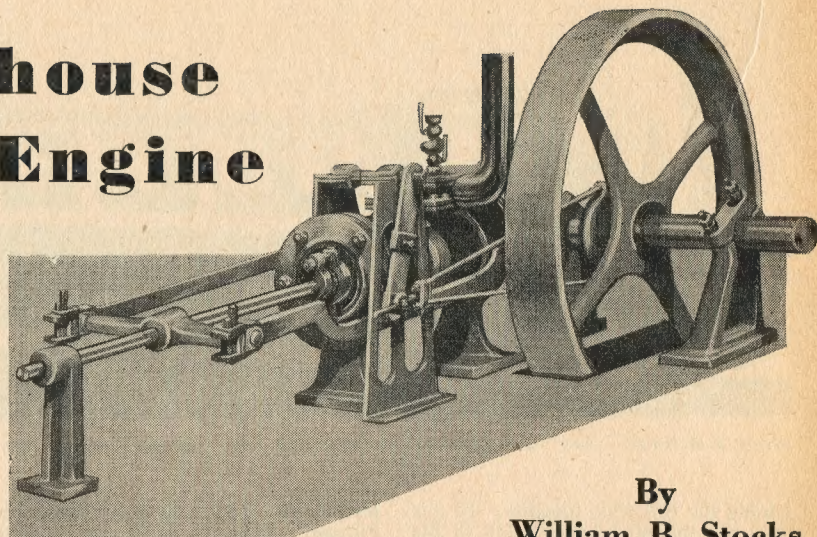
Remember these clanking by in the war? Mr. Beale, of Chelmsford won a Silver Medal with this excellent "O" gauge model

The Fieldhouse Steam Engine

HOW IT WAS DISCOVERED
DISMANTLED AND TRANS-
FERRED TO A NEW SITE
AT THE RAVENSKNOWLE
MUSEUM, HUDDERSFIELD

SINCE my letter in *THE MODEL ENGINEER* for November 1st, 1951, appeared, referring to the old steam engine at the Fieldhouse Brickworks, Huddersfield, which is being preserved, so much interest has been aroused that I think the time has come to describe this interesting relic more fully.

The Fieldhouse Works of the Leeds Fireclay Company have not been worked since a few years before the last war. The works were established in 1850 when originally a coal pit shaft was sunk and equipped with a steam winding engine which I believe to be the same engine which we are now preserving. This belief, taken in conjunction with an independent opinion of the South Kensington Science Museum, that the design suggests about 1850, forms my



By
William B. Stocks

Artist's impression of the Fieldhouse engine as lying at the old brickworks. The crankshaft is drawn shorter than reality. Actually it extended to drive the winding barrel

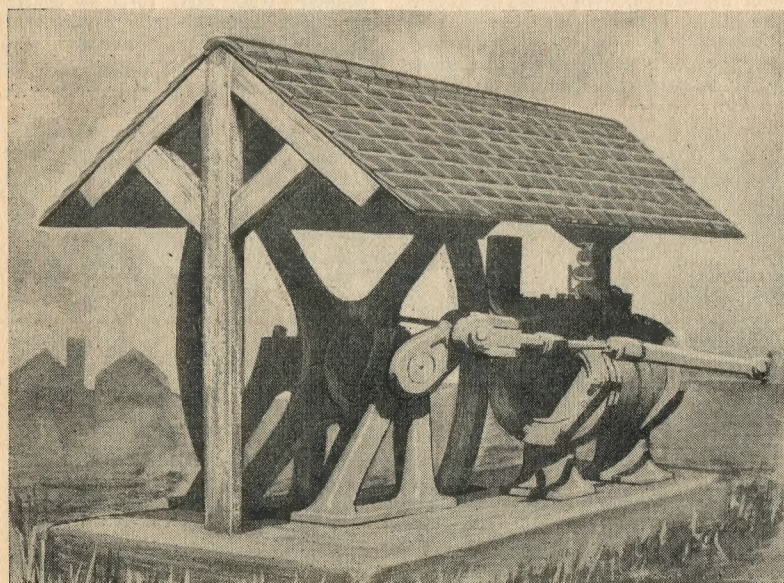
grounds for giving the engine an approximate age of 100 years.

For several years I have been gathering information for a comprehensive history of Huddersfield's railways, tramways and canals. It was whilst my friend, Mr. A. J. Brooke of Elland (well known in the West Riding of Yorkshire for his exquisite tram-car models), and I were doing some field work in this connection that we "discovered" the old winding engine lying derelict. An old brick hut and a liberal covering of grease had protected it from

the worst effects of exposure. Permission was sought and readily granted by the owners for Mr. Brooke and myself to make an examination and detailed drawing and such photographs as were possible within the confined space of the hut. All this took place in 1947, and though the engine remained a source of great interest, no serious thought of ultimate preservation was entertained.

However, during April, 1951, I was delighted to receive a letter from the Leeds Fireclay Company (who were disposing of the site), asking me if I could find a permanent home for the old engine, and most generously offering it for preservation if I was successful. This was a challenge and an opportunity not to be ignored, and I wasted little time before meeting our local museum curator, Mr. E. Aubrook.

The Tolson Memorial Museum, Huddersfield, is an exceedingly well-ordered institution, being planned to reflect every aspect of natural history, topography and industry of the district. Like many museums, however, they are troubled by lack of space, and my old engine would need about 15 ft. x 8 ft. to stand in. In mid-June, 1951, I enjoyed a visit to the South Bank Exhibition and saw there an early table engine set up on a concrete bed out of doors, being well painted to stand exposure. This gave me the notion that our engine could very well be exhibited in the museum's extensive grounds, particularly with the extra protection of a tiled canopy overhead. Warming to this idea, I prepared a water-colour of how this might look and gained an interview with the Mayor of Huddersfield, Councillor G. B. Jones. He gave me much encouraging advice leading me to commit the whole case in a letter to the Town Clerk which outlined



The original watercolour submitted to the museum authorities suggested a cover for the engine as shown here. When eventually built, the cover had four posts

the nature and possibilities of the gift. This was to go before the appropriate committee in due course, and, in the meantime, I discussed the matter with one or two members of the council. The outcome was most gratifying. The museum authorities gratefully accepted the engine and selected a very good, raised, site for its foundations. Furthermore, the old established Huddersfield Engineering Works of Messrs. Thomas Broadbent & Sons Limited very generously undertook to remove the engine from its present position, restore it in the works, and reassemble it on its permanent site, as a gift to the town. Arrangements were made for Mr. Brooke, myself and one or two enthusiastic friends to give every assistance we wish, and for the whole operation to be recorded by cine camera.

It is a great pity that, so far, we have been unable to establish the maker's name. The engine has many interesting features including the layout of the cylinder in relation to the crankshaft; this works away from the crank to which the motion is transmitted by a return connecting-rod, rather like a table engine, though this one is, of course, horizontal. The large 8-ft. diameter flywheel, with its four straight spokes, has a false rim bolted to the circumference in order to increase its weight. This circumference is solid except for the bolt holes, but the pulley boss is split to facilitate cooling when first cast. The flywheel is secured to the crankshaft by four taper keys bedding on flats on the shaft. The flywheel bore is actually clear of the shaft between the keys and is an old method known as "staking" the wheel to the shaft. By this means accurate machining of the bore is avoided and the wheel is set true by adjustment of the taper keys.

Curious Valve-gear

An oddity is the double bend in one side of the connecting-rod, in order to allow it to clear the exhaust pipe. The valve gear is still rather obscure and doesn't seem to permit reversing the engine. This is rather hard to understand in a winding engine, unless gravity was used to a maximum for a complete cycle of operations. The valves are worked through a drop-lever with two projecting pegs. The eccentric-rod assembly terminates in a handle which allows it to be engaged with either of these pegs in the manner of an old-time locomotive "gab" gear. As both pegs are on the same side of the drop-lever fulcrum, the only effect would be to alter the length of the valve travel. There is no sign of any governor having ever been fitted. The original bed consisted of two large wood baulks about 12 in. square.

After the closing of the pit shaft, the engine was used to haul standard-gauge railway wagons up an inclined siding from the centre of the works to the level

of the Leeds and Huddersfield main line, where a junction is affected. (This, of course, assumes that my belief that it is the identical engine is correct.) The siding has two right-angle curves and bollards were placed at intervals to guide the rope.

Huddersfield with her extensive textile industry owes a great debt to the steam engine. Many of the mills have abandoned steam power (rather to their regret during electricity power cuts), but some fine examples are still to be seen, including a beautifully-finished and maintained compound beam engine driving a generator. Years ago, Messrs. Thomas Broadbent and Sons built several very handsome horizontal steam engines, some of which are still running. One old derelict mill still contains a rusty beam engine with a 25-ft. flywheel concerning which I entertain a suspicion that it might have been made by Murray, Fenton and Wood, Leeds, the pioneer engine builders founded by Matthew Murray who built a successful locomotive for the Middleton Colliery, Leeds, as early as 1812. The owners of the mill in question kindly permitted me to inspect the deeds of the property, from which I learnt that steam power was installed in 1830. This existing engine bears particular resemblance to a Murray design in the shape of the columns and beam, though it has obviously been modernised at some later date.

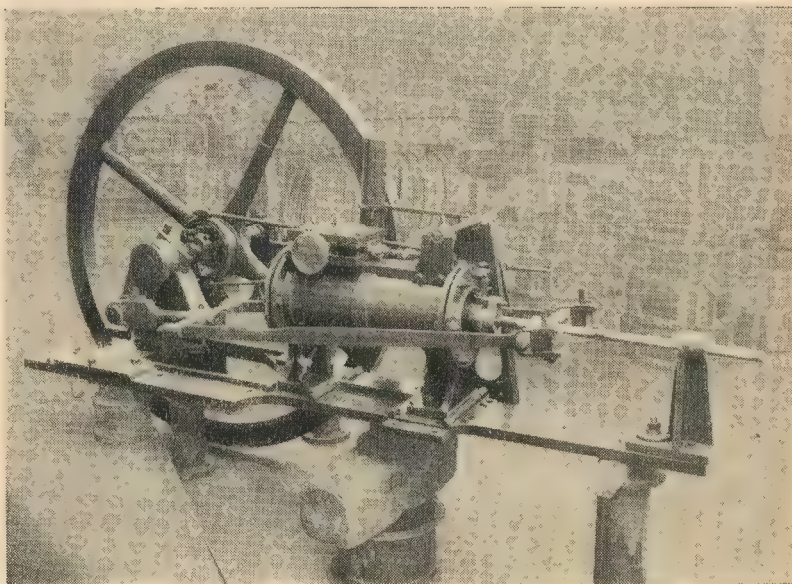
My experience with the old winding engine, coupled with my interest in other types of transport and industrial antiquities such as railways, sailing vessels, canals and barges, tramways, farm carts, etc., leads me to believe that the time is becoming ripe for a new

National Trust, to advise, study, catalogue and create funds for this type of work. The existing National Trust is well known for its admirable work on country houses, landscapes, and the natural beauties of our land, in which it has become the recognised authority and a source of new appreciation. My proposed Trust would really be essentially similar: it would be concerned with the aesthetic or intrinsic value of things which no longer have an obvious purpose in the world of economics.

At the New Site

As the work on the engine progressed, I found myself more and more tending to regard the entire operation as falling into three distinct stages, namely dismantling on the old site, cleaning and rebuilding in the works, and, finally, transporting to the new site at the museum and reassembling there. Each stage had its own unique problems. Thomas Broadbent & Sons Ltd., Engineers, Huddersfield, very generously offered to give all the facilities required to restore the engine, under the writer's direction, with arrangements included for a group of enthusiastic friends to do as much of the work as they wished, or were able to do. This arrangement has worked perfectly.

So we came to the final stage of re-assembly at the museum. The new concrete bed had been completed by the museum authorities some three weeks previously and was already to receive its precious burden. The site chosen was an excellent one, being a raised turfed terrace, but it involved the problem of moving the heavy castings, of which the engine is mainly composed, over twenty feet of grass



General view from behind showing gland of very early type and the shape of the bedplate. This photograph was taken at Thomas Broadbent's works, Huddersfield

from the stone steps which limited the closer approach of the motor wagon.

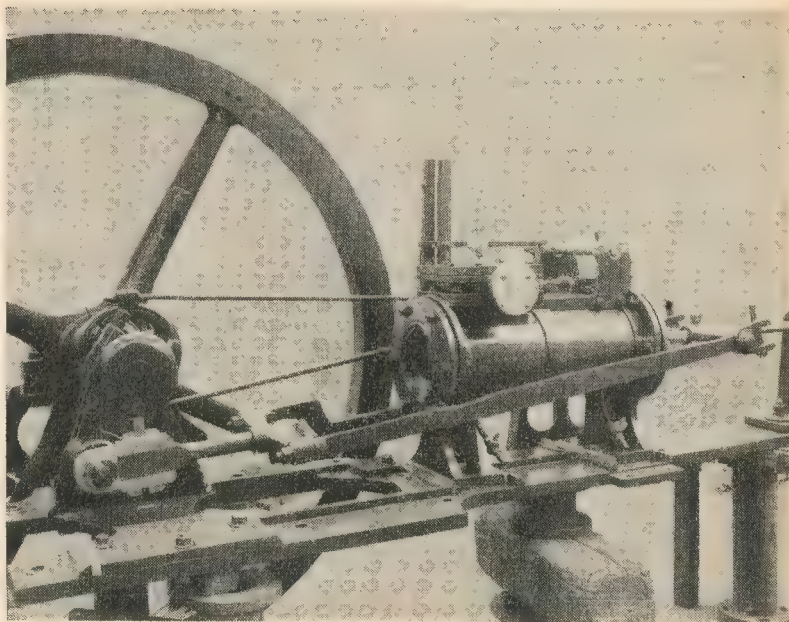
In consultation with Mr. J. Imeson, Thos. Broadbent's foreman millwright, whose skill had played a vital part in removing the engine from its original site, we decided to remove the crankshaft and flywheel from the cylinder and bedplate assembly, which could then be handled as a single unit. The four keys staking the flywheel to the crankshaft were driven out again and the wheel was ready for loading. It was decided to take the wheel first so that it could be lowered into the prepared pit and packed upright before the rest of the engine was manoeuvred alongside, and the crankshaft threaded through the bearings and the wheel.

It seemed disagreeable to have to remove the wheel from the shaft a second time; it had caused a lot of trouble to get true again when it had been off for the shortening of the shaft, but we agreed that it was by far the best way of handling the job on the site. The flywheel made a lorry-load on its own, as it is 8 ft. 4 in. in diameter and weighs approximately 22 cwt. This rested flat on timber packings, on the lorry platform, and was removed at the site by means of planks and rollers. By this means it was moved forward, bit by bit, with no damage to the turf, until it lay close to the slightly raised concrete bed. A set of three-legs with 30 cwt. chain blocks had been rigged over the bed, so it was simplicity itself to pick the wheel up by the nearest point of the rim, swing it round, and lower it into its pit where it was packed upright.

In the meanwhile, the lorry had returned to the works for the remainder of the engine. The tail end of the engine bed overhanging the back of the vehicle sufficiently to allow us to rig a chain sling round it, so we decided to set up a second set of three-legs at the unloading point and take the part weight of the assembled bedplate and cylinder. This assembly had a total approximate weight of 35 cwt. And so, with 2-ton blocks and tackle, we edged the engine part way off the lorry, then packed it up, and slung it again nearer the centre.

The engine was now in a position of being partly suspended an inch or two above the rear end of the lorry platform, with its furthest end still resting on the lorry. Three of us (including the writer, who turns the scale at about 14 stone) then stood on the outermost part of the engine bed, and our combined weight served to raise the engine completely clear of the lorry which drew out. Planks were quickly put in position underneath us with rollers, and engine and human ballast altogether were lowered off. Thus we unloaded our engine in about half-an-hour, and felt very pleased with the success of our methods.

It will be of interest to explain that, using the three-legs in this fashion, we braced the head back to the flywheel



Close-up showing crank and big-end bearing. The large cast-iron flywheel with its four spokes is clearly visible. This photograph was also taken before the engine was removed to the museum

(in the pit as already explained) by means of rope, to enable us to pull the engine, with such rollers as we could get beneath, off the lorry. As a further precaution we roped the legs together at the bottom.

A Change

Conditions were distinctly different from our experiences removing the engine some three months before on the Fieldhouse Brickworks site. There everything was filthy with old grease, now we had clean paintwork to handle; we enjoyed magnificent weather for our earlier effort, now rain seemed to threaten every hour; at Fieldhouse we worked in solitude except for the curious eyes of passing engineers on the Leeds railway, now we were operating in a public park in the midst of the school summer holiday and juvenile spectators found us good entertainment. I recall pulling on a spanner whilst my friends grouped around supporting a heavy fitting we were fixing, and one small boy requesting us to move our legs, as he couldn't see very well! Others, hearing that we had brought an engine, asked where the rails were, and some of these were not so very young either!

The engine was now beginning to look like its complete self again and, as the really heavy lifts were behind us, we dismantled the lifting tackle in order to tidy the site and give us more room for what remained. Next came the outboard bearing with its massive cast-iron stand. This was manhandled up a plank and into position. Then four of us managed to raise the crank and crankshaft, and pass it through the flywheel

bore and on to the bearings. A bore of a wheel that is staked to the shaft certainly offers a great advantage for doing a job of this sort. Until the keys are driven in, the bore gives any amount of slack. We drove the keys home and removed the packings holding the wheel.

Then to reassemble the big-end bearing and drive the cotter home between the gibs. The eccentric to bolt in place on the crankshaft taking care to fix it in a proper relation to the crank. To the eccentric sheave we added the strap, the eccentric-rod, etc., to couple up to valve linkage and now our engine was practically complete again. It seemed incredible that this advanced stage had been reached by the evening of the same day that had seen us start loading the flywheel at 10 a.m. Indeed, it is a tribute to the methods of an experienced millwright's department, and it was an education to work with them.

The following day we worked on the flywheel to make it as true as was possible with a staked wheel that had never been in a lathe (neither in the bore nor on the rim). Our success was surprising, for we finally left the wheel correct to the plumb-line in the vertical plane and only $\frac{1}{4}$ in. out on the centre-line of the bed.

So we come to the closing stages of a very memorable and absorbing experience that has, in its modest way, made history in circles where steam engines are spoken of with affection and regarded with pleasure.

The photographs accompanying this article are by courtesy of Messrs. Thos. Broadbent & Sons Ltd.

Modifications to Ex-Government Motor Generators

By L. Frater

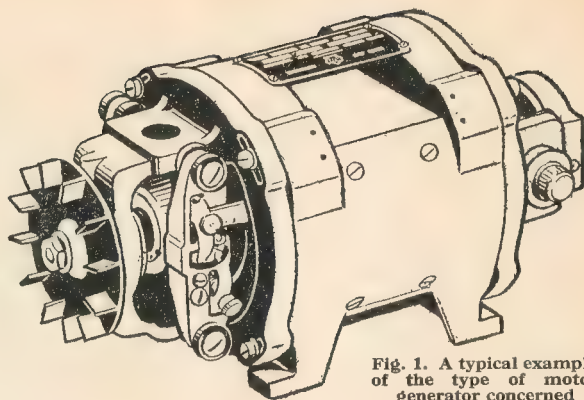


Fig. 1. A typical example of the type of motor generator concerned

THE writer has read, with great interest, recent articles in *THE MODEL ENGINEER*, on various methods of modifying ex-government motor-generators or rotary converters. In the main, these all consist of reconnecting the field winding in series with the high-voltage armature winding, and removing the low-tension brushes. The result of this is, as a rule, a comparatively slow build-up of speed, which continues to increase until limited by bearing friction and wind resistance. This speed can be very considerable and in many cases excessive, due to the excellent type of bearings used in these machines. In a recent article "Duplex" uses a friction brake to control this.

The danger of this high, uncontrolled speed lies in the possibility that the binding round the armature coils, and also the commutators, will burst, due to centrifugal force, with quite spectacular, not to say disastrous, results. This is especially the case in open-type machines.

What happens depends almost entirely on the method of construction, and this, as anyone who cares to have a look round the surplus market can ascertain for himself, may have any one of a wide variety of forms. Fig. 1 illustrates a typical example of these, which has been widely and successfully used.

In general, the points to look for when considering the suitability or otherwise of a machine for conversion

to a motor to work on a.c. mains are:—

(1) The pole-pieces should be laminated, otherwise considerable heating takes place due to eddy-currents.

(2) Not more than two commutators. Quite a few machines are available with three commutators and three sets of brushes, and while these can be made to work, it does mean that quite a lot of valuable armature winding space is occupied with windings which are better out of the way.

(3) The electrical details of windings are the biggest and most contradictory problem, as the high-voltage armature most suitable would be about 200 to 250 volts, and the low-voltage side of the machine, from the point of view of the field winding, which is normally in shunt, or parallel with the low voltage armature winding, should have as large a voltage input possible. Normally, this will be about 28 volts. Against this is the fact that for our purpose, the lower the voltage input to the low-tension side of the machine, the less is the space occupied by the low-voltage armature winding and its insulation, and the lower the voltage which is developed in this set of armature windings.

A very satisfactory type of conversion, which has been described a few times, consists of swinging the low-voltage brush gear through approximately 90 deg., and connecting them together, which gives a type of operation similar to an Atkinson repulsion motor. Unfortunately, however, this has the dis-

advantage that the alteration is usually troublesome from a mechanical point of view.

Some details of the behaviour of a General Electric dynamotor, rated at 27 volts $1\frac{1}{2}$ amps input, 285 volts 0.06 amps output, may indicate the possibilities. The altered low-tension brush gear was arranged so that it could be swung about plus or minus 20 deg. from the new 90 deg. position, with the result that the speed could be adjusted over quite a wide range (Fig. 3). Advancing in the direction of rotation, slowing it down, and vice versa. As might be expected, the voltage across the high-tension brushes varied accordingly, being about 65 volts at the slowest speed and about 160 volts at the other extreme. In spite of increased friction due to the additional brushes, the power output was noticeably increased. A very practical detail was that the new brush gear consisted of a brass ring carrying the two brushes, thus automatically connecting them together.

In passing, it would appear to be desirable to insulate the shorted brush gear, in order to relieve the stress on the insulation of the armature windings. This was not considered to be necessary for the experiments.

The writer has had in use for some years, driving a small grindstone, a dynamotor which was obtained from an American I.F.F. set.

A brief description may be of interest. It was made by Pioneer, and called a "Gen-E-Motor." The input was 18 volts, and the output 450 volts. As originally constructed, it had a blower casing at one end, with a four-bladed 3 in. diameter fan mounted on a $\frac{1}{4}$ -in. spindle, and at the other end was a $\frac{5}{32}$ in. spindle, which was used to drive a chain of gears and cam-operated switches. All the extra bits of metal were removed with a hacksaw and file, and there remained a nicely enclosed motor, with useful lengths of spindle projecting at both ends. The pole-pieces were laminated, but unfortunately the magnetic circuit was completed through the solid iron case. It should be noted how far short this is of the ideal, mentioned earlier. The normal



Fig. 2. Illustrating method of fixing copper shorting strip round low-voltage commutator

electrical alterations were made, i.e., the field in series with the high-voltage armature, and the low-voltage brushes removed.

This has proved most useful, but the disconcerting effect of the speed building up and up, as if to say "we take off any time now," recently led to a determined effort to curb this.

The solution was finally obtained from consideration of a repulsion-start, induction-run motor. This consists of a commutator type of rotor, with brushes arranged for starting, which when speed builds up, are removed by centrifugal action, and a short-circuiting ring substituted.

A small amount of guessing and estimation, the combination of these two words being an old-established, if somewhat disreputable, engineering term, were indulged in, and led to the following rough conclusions. The turns ratio of the armature windings was 25 to 1. The number of commutator segments was 26. Assuming that three-fifths of the mains volts, or about 150 volts appeared across the high-voltage commutator, it seemed probable that the maximum voltage likely to occur between adjacent segments of the low-voltage commutator would be in the region of half a volt. It was thought that short-circuiting a coil carrying this difference of potential would not cause serious harm as in any case it appeared likely that the short circuit current would be limited by the reactance, or a.c. resistance of the winding.

A $\frac{1}{2}$ -in. strip of copper (22 gauge) was, therefore, wound round the low-voltage commutator and clamped as illustrated in Fig. 2. This small alteration, combined with a careful check to make sure that it was quite free to rotate without hitting anything, took merely a matter of minutes to accomplish.

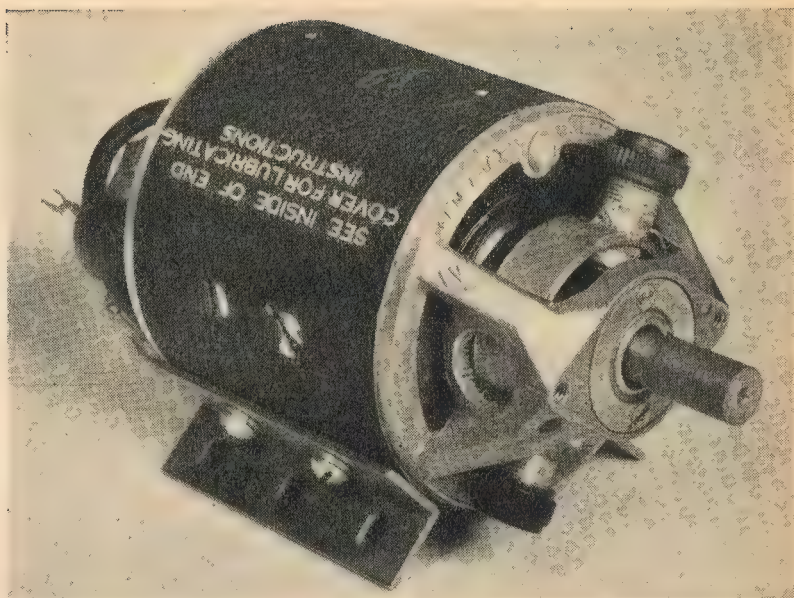
The motor was then switched on, and it was found that up to about 2,900 r.p.m. (being a 2-pole machine) it behaved like the normal series type, but any increase of speed above this was prevented by the shorted winding acting like a squirrel-cage rotor.

The output power proved to have increased somewhat, in spite of the lower speed, although the falling speed with load characteristic remained much the same. The heating which occurred was also roughly the same as before, and appears to be fairly evenly distributed between the armature and the field.

The voltage across the armature was now measured, and found to be about 125 volts on no load, rising to 150 volts with a fairly heavy load, which appreciably slowed it up.

This seems to be a reasonable compromise from an electrical point of view, and, in practice, has proved quite satisfactory, completely curing the former tendency of the speed to keep on building up.

Most conversions of this kind are, at the best, makeshifts, and only suitable



Modified low-tension brush gear fitted to G.E. Dynamotor to test the effect of varying brush position

for intermittent use, but within their limits, they are a useful and economic proposition for the impecunious like

the writer, who is now prepared to sit back and await the bricks which are sure to be flung by our electrical experts.

SMALL SCALE LOCOMOTIVES AT THE "M.E." EXHIBITION

(Continued from page 415)

train and one itched for a layout and a "Castle" with which to parade them.

Going back to earlier times were four "OF" models from Mr. H. A. Thompson of Plymouth who won a V.H.C. Diploma. The exhibit consisted of three Great Eastern Railway six-wheeled coaches and a 10T box van. Out of these, I preferred the van for, although the coaches were good models in themselves, their appearance could have been transformed with a little more research as regards lettering and numbering. I believe, for instance, that standard G.E. practice was to put the coach number and company initials above the windows, and not on the waist panels. In addition, the class numbers on the doors were almost twice their correct size—convenient, no doubt, for the short-sighted traveller but rather startling for the modeller trying out his National Health glasses. The teak finish was exceptionally well done, though I can't omit to say, with my tongue firmly in my cheek, that it was much too clean for the G.E.!

As a closing paragraph, a little analysis of the small locomotives might reveal some interesting points. First, about 50 per cent. of the models would have

stood a much better chance with more attention to painting. This seems to be a maxim repeated year in, year out; and with good cause, for it applies at every exhibition in the country. Let's hope that one day it will sink in. Second, out of the sixteen locomotives no less than eleven were for two-rail electrification and there were two for stud-contact. Four were for EM gauge, five "OO," four "O," two narrow-gauge and one, in a "class" of its own, for $2\frac{1}{2}$ mm. gauge. There were two models of standard British Railways locomotives, four pre-group and eight of the grouping period (1923-1947). There have been times when the pre-grouping period held the greatest attraction for railway modellers, but this year at least, the "big-four" have the field. It seems very true that as things recede further into history, so one's mind is able more easily to forget the bad things and remember only the good ones. So, if anyone wants an "M.E." Exhibition of B.R. standard models, it looks as though he will have to wait until the B.T.C. are operating their trunk routes with helicopters, or conveyor belts, or rocket ships, or something. . . .

Small Twist Drills

A SIMPLE SHARPENING DEVICE

By Len Brown

I AM aware that there has been a considerable amount of discussion relating to the sharpening of twist drills, and the somewhat involved geometrical formulae associated therewith. I trust this will not prevent the publication of details of a more down-to-earth solution of this ever-present difficulty experienced by many users of drills. Personally, I have found it impossible to attain the necessary skill accurately to repoint and sharpen drills free-hand, more especially the smaller sizes under $\frac{1}{8}$ in., so that they cut freely and form holes reasonably accurate to size.

These are, of course, the sizes that are not covered by the several drill grinding jigs at present available, some of them at considerable expense.

I have been using my device for some two years with entire satisfaction; formerly I was compelled to admit to failure when required to perform on a small diameter drill.

My device consists essentially of a small vice in which the drill is gripped whilst the two cutting edges are formed by honing on an oilstone.

The material required is mild-steel or cast-iron, approx. $1\frac{1}{2}$ in. $\times$ 2 in. section, in a length of $2\frac{1}{2}$ in., this to be faced up accurately to the form and dimensions of sketch.

Particular accuracy is required in forming the 118 deg. inclusive angle, and in forming the two small "V" grooves at 90 deg. to base and exactly bisecting the apex angle.

The block is drilled, say $\frac{3}{8}$ in. diameter, lengthways, for twin clamping bolts,

it is then sawn into the two vice elements, the sawn faces being accurately machined.

The clamping bolts are a press-fit into one of the vice jaws, or cross pinned, the other having the holes reamed to a sliding fit on the bolts.

Suitably knurled nuts for the finger tightening of the jaws are required. The exact size and threading of these bolts can be as convenient; $\frac{3}{8}$ in. B.S.F. is suggested.

The sliding jaw has the "V" grooves in which the drill is located, and as stated these must be very accurately formed, clean cut at 90 deg. to the base and exactly cutting the apex angle 118 deg. inclusive.

This sliding jaw, if the job is reasonably accurately formed, is reversible, so that either of the two "V" grooves can be brought into operation. One groove, it is suggested, should be small enough to enable the smallest drill used to be clamped, and the other to take say $\frac{1}{16}$ in. to $\frac{1}{2}$ in. diameter.

Now as to the manner of using the device; arrange the drill in the groove, lightly clamped, with the point protruding only just enough to allow for the formation of a new point, in order to minimise the amount of honing required.

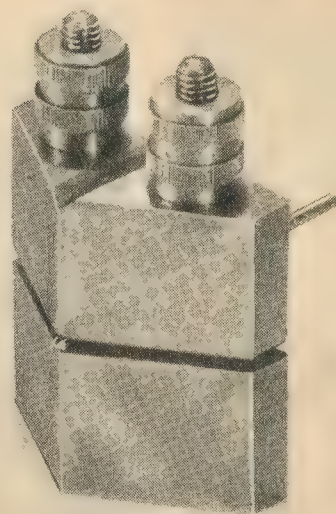
The only other operation required is to align the centre of one flute of the drill point with the line of the apex of the device, and slightly to rotate the drill anti-clockwise by finger pressure, or with small gripping pliers.

The amount of this offset determines the backing-off angle of the cutting

edges, and should be confined to the minimum that will enable the drill to cut freely. This will very quickly be found by a few trials.

For the very small sizes, a good glass will be necessary, or at least a help.

The clamping screws are now tightened, and one face rubbed on the stone until a straight-edge or rule will



The special vice, with small drill in position

pass over the surface without obstruction from the drill point, the other face is then dealt with in the same way.

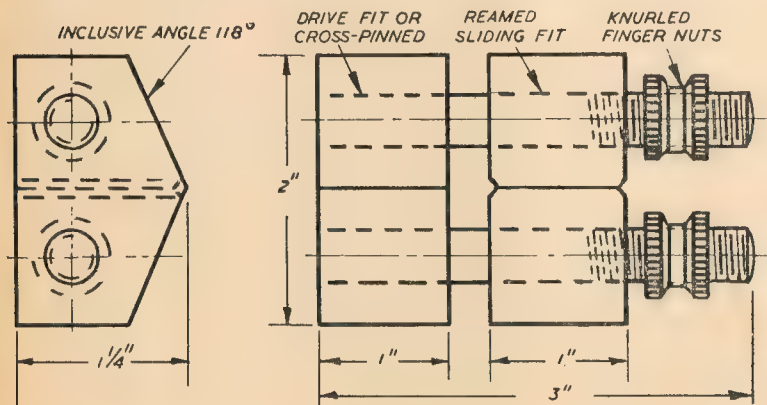
It is particularly noted that both edges are formed on the drill at the one setting thus ensuring correct angle of point, and exactly equal length of the two cutting edges—perhaps the two most essential features of drill pointing. You also have a definite control of the backing-off or relief of the cutting edges.

Of course, you have a flat backing-off; this will, no doubt, horrify the purist and the experts, who can produce the above features free-hand with the addition of a perfectly formed conical point. The fact, however, remains that for all practical purposes of the amateur or model engineer, drills with flat reliefs will cut at least as well and as accurately as those supplied by the makers of drills.

In the very small sizes, drills have always had this flat relief. All I can suggest is that a careful trial is carried out.

I am satisfied from my experience that this device will give extreme satisfaction to anyone who has had any difficulty with drill pointing, but only provided the tool is made accurately in the features emphasised, and care is taken with the setting in the "V" grooves.

(Continued on page 425)



L.B.S.C.'s

Netta

VALVE-GEAR FOR THE 3½-in. GAUGE ENGINE

HERE are the promised drawings for the valve-gear for the 3½-in. gauge engine; three views of the complete bag of tricks, and all details—nothing left to your imagination! It took me a long while to get them out, and it is hard going for an old body like me, as I can't work sitting down; and several hours spent bending over a drawing-board, literally gives me a pain in the neck—plus a pair of aching shoulders as well! However, the good folk, and there are many of them, who are building the locomotive, will reap the benefit, and that is your humble servant's main consideration.

Whilst the valve-gear differs but little from that specified for the 2½-in. gauge quin, there might have been a little confusion had I made one drawing for the two sizes, and I'd hate to cause builders needless trouble in "sorting out." On the 3½-in. gauge job, we can just manage a separate eccentric drive for the lubricator, rendering it quite independent of any connection with the valve-gear; I have shown this, in place, in the plan view, and you can see that it is a tight squeeze to get it between the valve-gear forks, and the pump. However, it's there, and it just clears, and the old saw says that a miss is as good as a mile. Silver-steel bolts are used to connect the valve-spindle forks to the intermediate link, and these will run a very long time before slackness develops, provided that they are properly fitted in the first instance.

As this engine has buckle-driven slide-valves, adjustment cannot be made by turning the valve spindles. With the straight-through drive as shown, it is essential that none of the forks should be at all loose on the spindles; and that puts out of court any attempt to make adjustment by turning the valve-spindle fork around, as there isn't room for a locknut to tighten it. I am, therefore, specifying an arrangement whereby equal port openings can be achieved without any rod adjustment at all. A simple jig is made, with two bits of ½-in. × ½-in. flat steel, joined at the top by a small bolt, like a pair of compasses. When the valve-gear is erected, this is put in place of the valve link, between the intermediate and valve spindle forks, and adjusted until equal port openings are obtained when the wheels are turned by hand. The permanent valve link is then made with the pinholes at exactly the same centres; and when this is fitted, the port openings

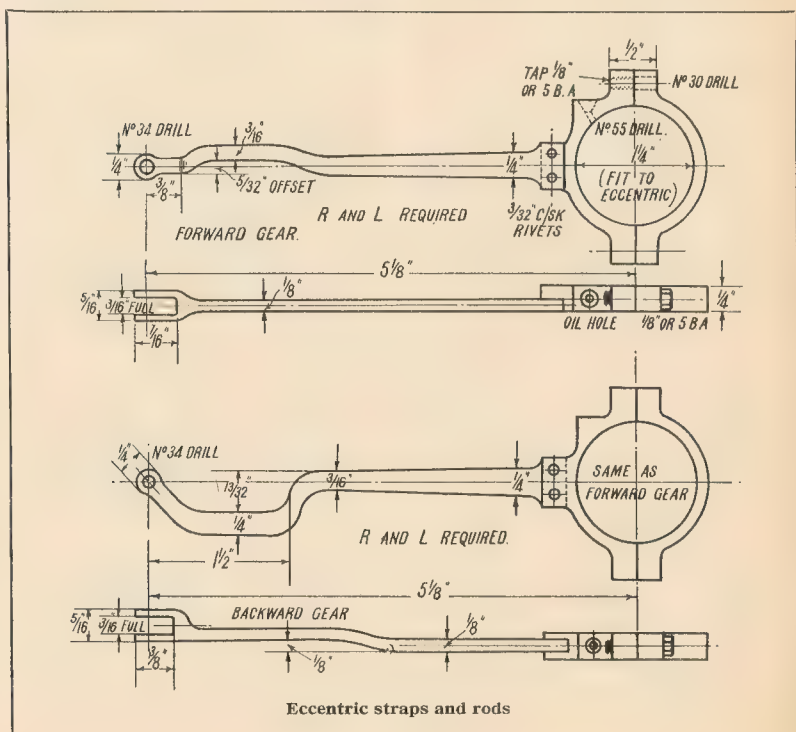
should be correct for all time. I'll give full instructions for this job after describing the valve-gear for the biggest quin, as the same valve-setting instructions apply to all three locomotives with link motion.

Same Again!

The essential parts of the 3½-in. gauge valve-gear being the same as the 2½-in. as described in the last instalment, repeating the notes on machining and erection would be just waste of space; all you have to do is to use previous instructions, with the dimensions given on the drawings reproduced here. The eccentric-rods can be marked out on ½-in. sheet steel, and sawn and filed to outline, same as before, but note that the back-gear rod is fitted in a slot in the centre of the lug on the strap, to give a little more clearance between the two rods. Assemble them on a jig, as previously described, as all four must be exactly 5½ in. between centres, if the engine is to do her job in the approved

manner. Incidentally, I couldn't help chuckling when I compared my dimensions with those of big sister, as 5½ in. corresponds exactly to the 6 ft. 10 in. of the original; so if *Netta* fails to deliver the goods, you can just blame Wilson Worsdell, and not Curly! However, I don't think there is any fear of that.

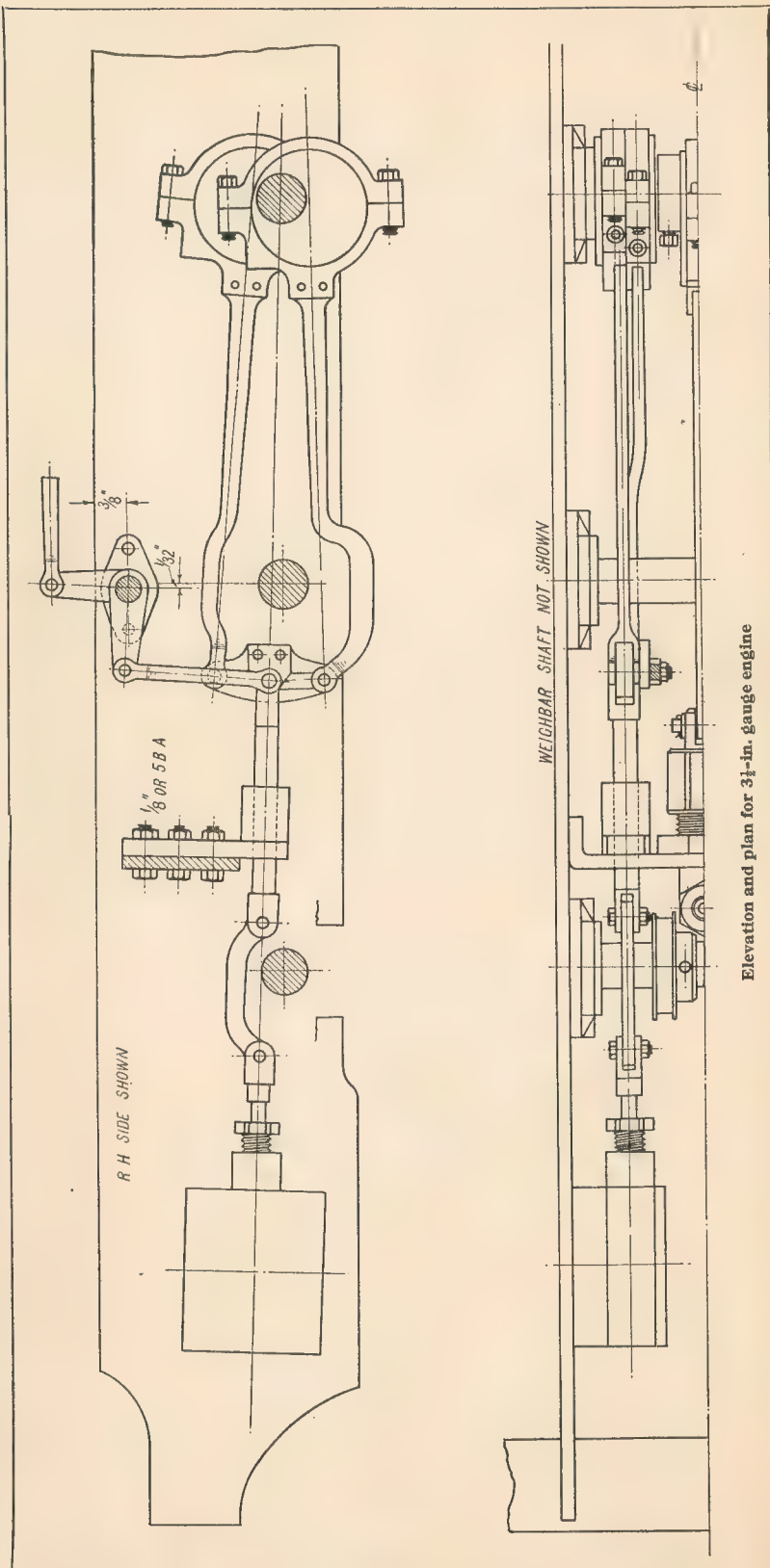
The same type of expansion link, with the single lifting link *a la* Swindon instead of Gateshead, is again specified, the reason being obvious if you take a look at the plan. The securing nut of the lifting link only just clears the gudgeon-pin in the pump ram; and there isn't room for another lifting-block and link on the other side, owing to the proximity of the hornblock and axlebox. The blessed pump is, of course, the culprit; had it not been for that, I could have set out the lifting apparatus in a similar manner to that on the full-sized engines, which were innocent of eccentric-driven pumps. Tip: anybody who finds that the clearances are a bit too close for their liking, can steal a



little bit more, by filing a flat on the side of the pump ram, alongside the slot, deep enough to take the washer and pin. Drill the hole for the pin as close to the washer as you possibly can; and when the pin is inserted, file the end of the gudgeon-pin to within $1/32$ in. of the split-pin hole. That will give another $1/8$ in. at least, and as it is unlikely that Inspector Meticulous will poke his head under the boiler, he won't be any the wiser! Alternatively, a countersunk-headed gudgeon-pin could be used, with a plain part under the head, for the eccentric-rod eye to run on, and the end screwed $1/8$ in. or 5 B.A., one side of the slotted end of the ram being tapped to suit, and the other side drilled clearing, and countersunk. It doesn't matter which route you take, as long as you arrive safely at your destination.

The intermediate valve spindle is just an enlarged edition of the one previously described; when making it, be sure that both the fork ends are dead in line when screwed tightly home. One of them could, with advantage, be brazed or silver-soldered to the spindle; it is obviously impossible to braze both, or the spindle couldn't be put through the bearing on the bracket. It is quite likely that somebody or other will raise a quibble about the likelihood of the spindle trying to twist when the engine is at work. I don't anticipate for one moment that such a thing is likely, as the fork should be a good close fit on the expansion link, only just free enough to allow the latter to slide in it; and it is a million dollars to a pinch of snuff that the expansion link won't misbehave itself, being held in position by the eccentric-rod forks at top and bottom, and the lifting link at the side. However, any doubting Thomas can make assurance doubly sure, if he so desires, in several ways. The spindle itself can be made square or rectangular, and the hole in the bearing broached out to suit, with a simple broach made from a bit of the same section steel, as used for the spindle. I'll return to this subject again, all being well, when dealing with the biggest quin's valve gear. Another way would be to endmill a $1/8$ -in. groove in the round spindle, and fit a feather key to it, cutting a corresponding keyway in the bearing. The same groove could be left as cut, and a set-screw put in under the bearing, with the point engaging in the groove, in the same way as the tailstock barrels of certain cheap lathes are prevented from turning. The simplest way of all would be to file a flat on the spindle, and fit a flat-ended set-screw or peg in the bearing, to engage with it.

Beginners may find that their taps and dies cut slightly slack threads, and the end forks may not be absolutely rigid when screwed home. If such is the case, they can make certain that the forks won't shift, by drilling a No. 53 hole clean through spindle and screwed stem of fork, and squeezing in a pin



Elevation and plan for 3 1/2-in. gauge engine

made from $\frac{1}{16}$ -in. silver-steel. File off any projection, flush with the spindle.

Erection

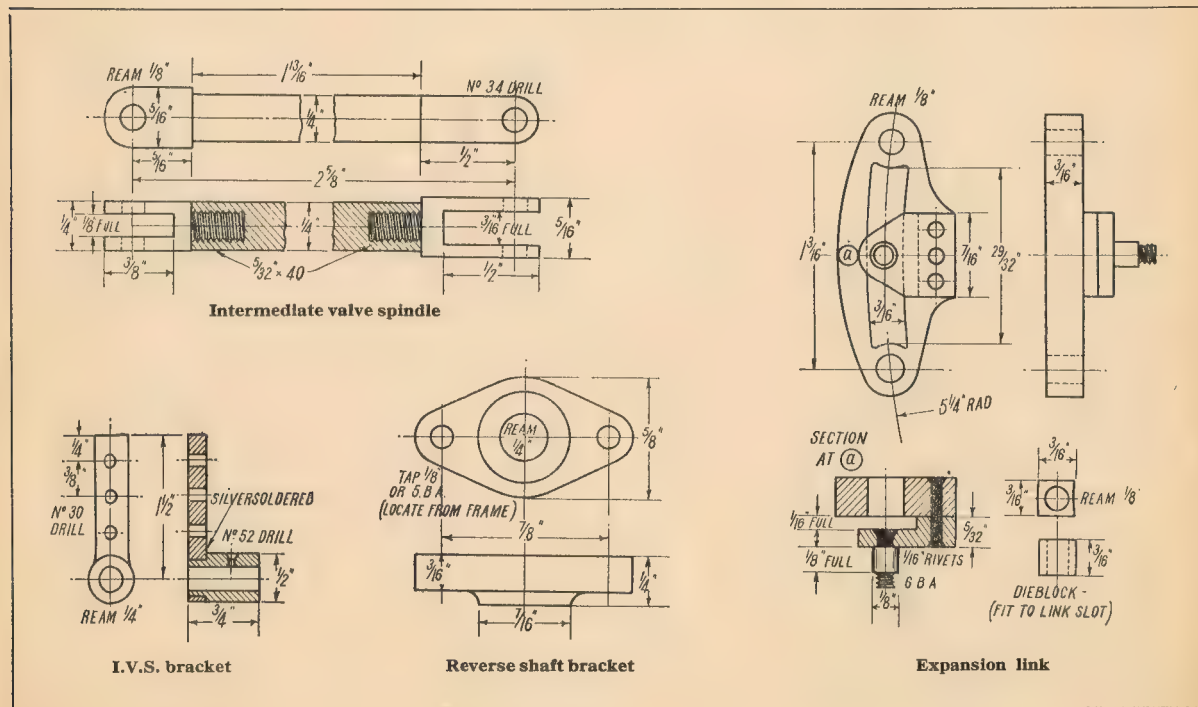
The valve-gear components are erected in the same way as described for the $2\frac{1}{2}$ -in. gauge engine, but once more I'll anticipate any querying, by calling attention to the fact that I specify drilling holes for receiving $\frac{1}{16}$ -in. press-fit pins, with No. 34 drill, when the drive-fit size is No. 31 drill, according to the laws of the Medes and Persians. Well, you'll hardly credit it, but I honestly assure you that it is gospel truth, when I tell you that in all my long years of experience, both in building little locomotives, and in doing other various jobs, I have not yet met a No. 31 drill that made a hole a drive-fit size for a piece of $\frac{1}{16}$ -in. silver-steel, that actually was dead $\frac{1}{16}$ in. when measured with a micrometer. In my workshop are two sets of drills, at this very minute, both by first-class makers, set in elaborate cast-iron plated stands. The No. 31 drill in each of them, has never drilled a hole direct in any metal that was anything but an easy-running fit for a $\frac{1}{16}$ -in. rod. In one of the sets, when new, the drive-fit could only be obtained by drilling the hole direct with the No. 34; and now you know why I specify that size, for a kick-off! Any builder who happens to be luckier, and finds that his No. 34 hole is too small for the press-fit, has only to put one size larger drill through, and try again, ditto-repeating until he gets the desired fit. I hope that nobody runs away with the idea that I, personally, am not able to grind drills that cut a

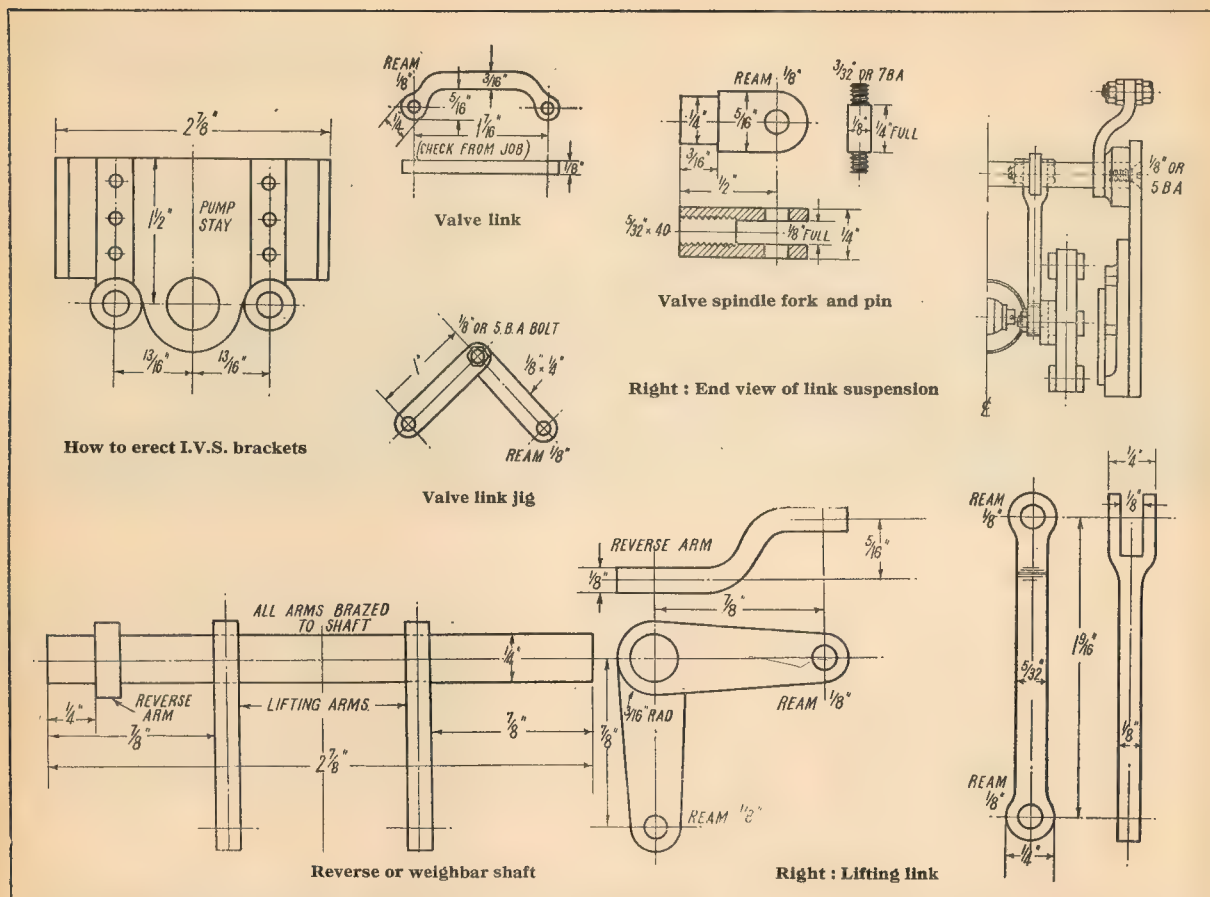
true-sized hole; after all the experience that I have had, I should be a Billy Muggins indeed if I couldn't grind a drill accurately in this present year of disgrace. For a $\frac{1}{16}$ -in. press fit, I start with a No. 34, and then run a home-ground 32 through; and when the pin has received the kind attention of my bush press, it would puzzle its nibs to fall out on the road!

Another query may be, why screws are specified for the eccentric straps, instead of bolts, as on the big engine. It is simply because screws are easier to put in, for the start; try holding a weeny nut against the end of a weeny bolt, with a pair of pliers, or any other means, while you start the thread, and you'll soon realise which is the easier. Another important point is that the screw takes a better "hold" in the length of the lug, than in an ordinary nut, and so is not so likely to work slack on the road. But hexagon-headed screws are shown in the drawing, just to show our old night-horse that I still regard him with affection! Another tip, which I have given before, but is worth repeating, for beginners' benefit. Use a box-spanner for screwing in hexagon-heads; it can be made in a minute or less, by using a short length of copper or brass tube which will just fit over the corners of the hexagon. Put a screw-head in the end of the tube, and hammer the latter down on to the flats. Put a small tap-wrench over the tube, and Sandy's your uncle, ye ken, for ye'll nae break a screw-head off an' waste yere bawbees. The soft copper will give before the screw loses its noddle.

Where bolts are shown in the illustrations, use pieces of round silver-steel, reduced at both ends, screwed, and furnished with ordinary commercial nuts, as shown along with the valve-spindle fork. This makes a neat job. The length should always be full, so that when the nuts are screwed up tightly against the shoulders, you can still turn the complete bolt with your fingers, which makes sure that the jaws of the forks are not pinched in, to cause needless friction.

Details of the reversing shaft, or weighbar shaft, are shown in full detail, and it is made and erected in the same way as the $2\frac{1}{2}$ -in. size. Note—On the full-size engines, the centres of the reversing shafts are located $\frac{1}{4}$ in. ahead of the vertical centre-line of the second axle. Our good friends of the North-Eastern area are sure to call me naughty names if I don't include this refinement on the $3\frac{1}{2}$ -in. gauge engine, so you'll see it all-present-and-correct-sergeant on the elevation of the assembled valve-gear. To locate the screw-holes for the reverse-shaft brackets or bearings, scribe a horizontal line $\frac{1}{8}$ in. from the top of the frame, at each side, above the intermediate axle, and mark a point on this, $\frac{1}{32}$ in. ahead of the vertical centre-line of same. At $\frac{7}{16}$ in. ahead of, and behind this point, centre and drill No. 30 holes, and countersink them. Put the brackets on the ends of the shaft, and set same in place, carefully locating it in the position shown, which is easily done if the lifting links are not attached to it. Use a small toolmakers' clamp to hold the flange of the bracket against the frame, while making the adjustment.





When O.K., tighten both cramps; make countersinks on the bracket flanges with a No. 30 drill put through the frame holes, follow through with No. 40, tap $\frac{1}{8}$ in. or 5 B.A., and put counter-sunk-headed screws in. Locknuts may be put on the projecting ends of the screws, if desired, for extra safety. The lower ends of the lifting links may then be fitted over the pins in the lifting blocks of the expansion links, and nutted up. The forked upper ends are placed over the ends of the lifting arms on the shaft, and secured by little bolts made from $\frac{1}{8}$ -in. silver-steel, as shown in the drawing of the valve-spindle fork. All being well, I'll describe how to set the valves, in the next spasm, when giving details of the valve-gear for the 5-in. gauge engine.

Link Motion for the Gauge "1" Engine

If any builder wishes to fit link motion to the $1\frac{1}{2}$ -in. gauge quinn, he can halve the $3\frac{1}{2}$ -in. drawings as a general guide for dimensions, but simplify "to taste." For example, the eccentric-rods can be made from $\frac{1}{4}$ -in. round rod, bent to shape, with plain eyes pinned to the side of expansion links nearest the frame; and the links lifted from the bottom pin, no blocks being needed. Make the links from $3/32$ -in. steel.

Small Twist Drills

A SIMPLE SHARPENING DEVICE

(Continued from page 421)

I have made large models with grooves to take up to $\frac{1}{2}$ -in. drills, and have used these in conjunction with an angle-shaped fence or guide fixed parallel to the side face of a grinding wheel. The drill is set in the "V" groove in the same manner as described above, but projecting sufficiently to cover the gap between the guide fence and the wheel. One angle face of the tool is held against the fence and the drill point traversed against the wheel until grinding stops; the other face is then presented to the grinding wheel, and results in a perfectly angled point, with exactly equal cutting edges and with a controllable angle of relief. I am unable to detect any difference in the cutting properties or the accuracy of even large diameter drills ground in this way, as compared with the normal. The chief value, however, is in connection with the smaller drills, which are not otherwise catered for. It should be remembered that all other cutting tools except twist drills have always had a flat relief as

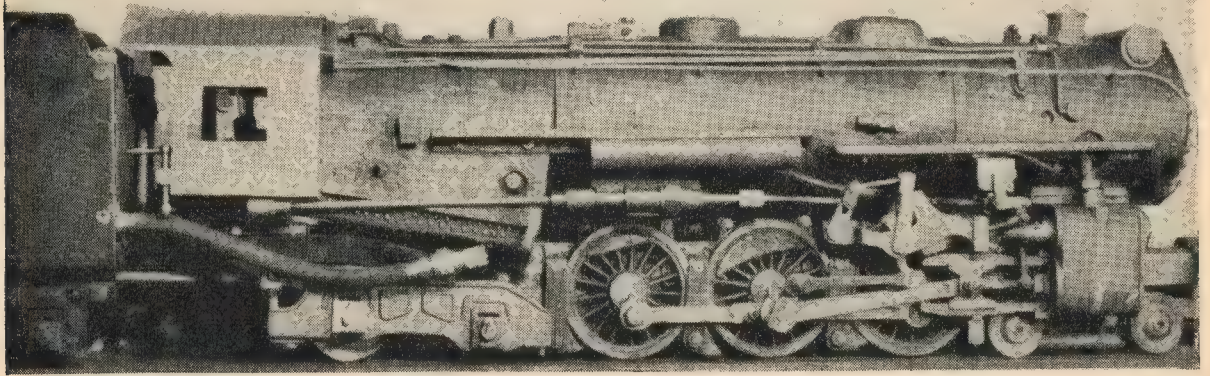
accepted practice, including the old spade-pointed drills, "D" bits, and spot-facers, Slocum centre drills, etc.

My conclusion is that it is only where maximum length of life between grindings is necessary that the conical point is required and shows any practical advantage. With this tool to assist me in the pointing and sharpening business, I am not really concerned with obtaining the maximum possible cutting life between grindings. In any event, it is a pleasant little item to make up, and the cost is practically confined to the time and effort expended.

Beyond the few general constructional suggestions given, together with the sketch and photograph, no further details should be necessary.

A refinement is a short length of compression spring over one of the clamping bolts, to give a spring operated opening motion to the jaws. A recess must be counter-bored in the fixed jaw to receive the spring when clamps are fully tightened.

Live Steamers



Bill Chapman's 1/2-in. scale Hudson

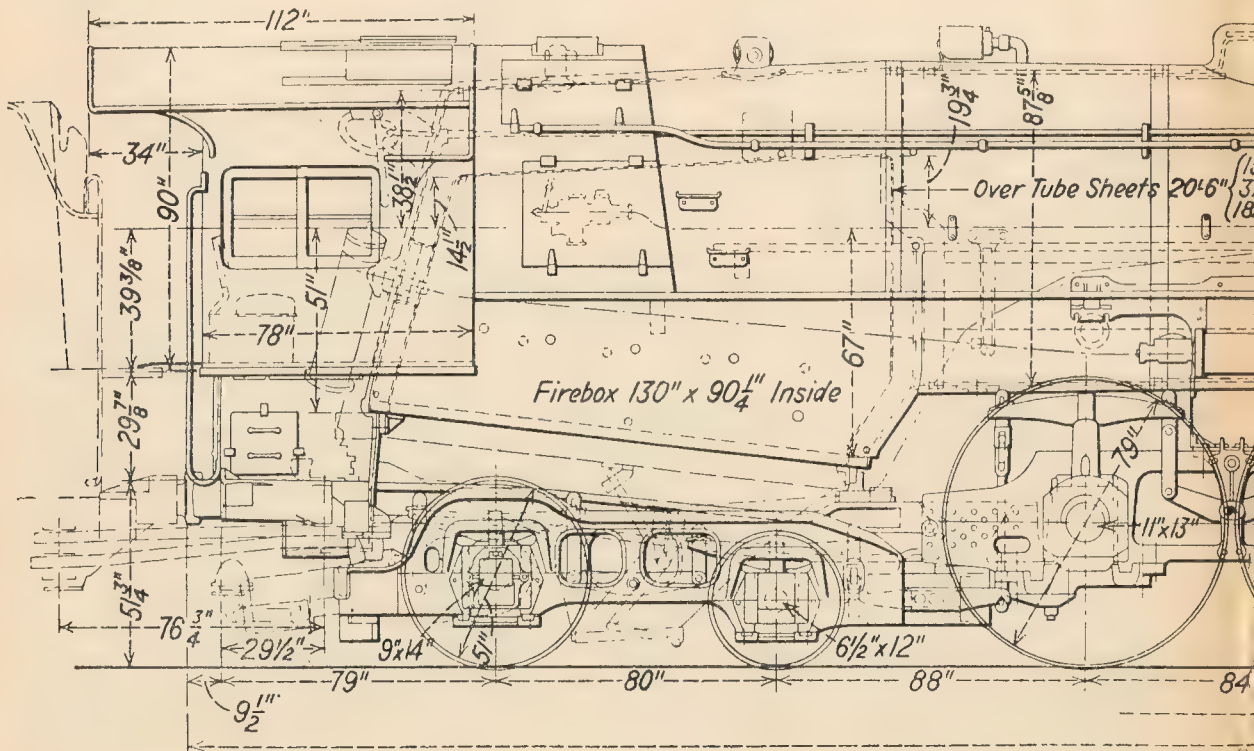
BILL GOESCH secured a set of drawings from the Great Northern Railway here with main offices across the river in our sister city of St. Paul. Of course suggestions from the good Doctor have been adopted. One of these is "L.B.S.C.'s" lubricator, which lies under the smokebox of Bill's 1/2-in. scale Standard Engine, and works from the

Concluded from p, 385, Sept. 30, 1954.

same shaft as the axle-pump. In its day, the fireman used to run out on the running boards and oil the cylinders with a big pot of tallow. Firemen of scale size being in short supply, Bill installed the lubricator instead. Adding a cab and tender will just about complete this job, as the engine runs beautifully on air. Realising that a track on which to run the locomotive is equally essential, he has also started to build a

sectional track for erection in the backyard. This will be about 150 ft. long of both 2 1/2-in. and 3 1/2-in. gauge. Both Mr. Larson and myself are assisting in this project, and I will try to send photographs of this some time in the future.

And now we come to the last and least member of the four—yours truly, Bill Chapman. This is a good London name from Cheapside, where the mer-



NEW YORK CENTRAL

in the New World

BRITISH MODEL ENGINEERING INFLUENCE IN MINNEAPOLIS

By Wilbur Chapman

chants were called "Cheapmen"—degenerating to its present form. Nearness to two well-known model engineering firms probably influenced my own love for "live steam."

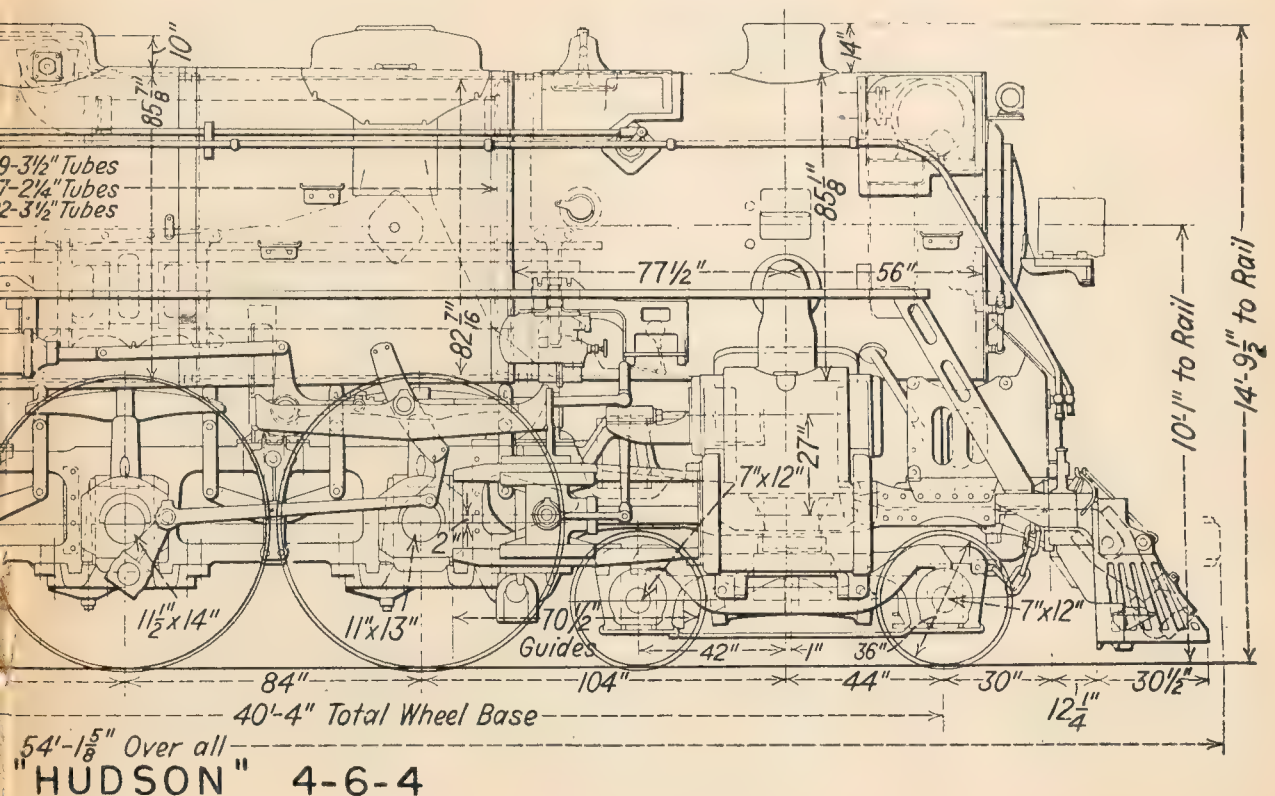
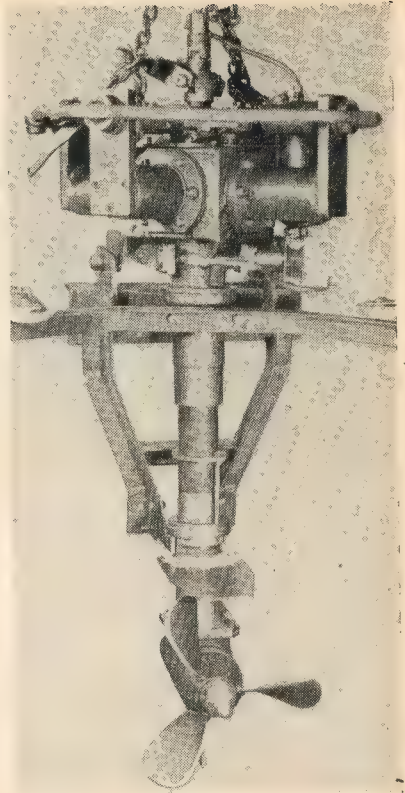
So, longer ago than I care to admit, began the project of building a 2½-in. gauge model of a New York Central "Hudson." Sad to say neither THE MODEL ENGINEER nor "L.B.S.C." were as well known as they are today, so a great many mistakes were made. I did chance on a copy of *Model Maker* in which the Doctor warned about staying crown sheets with girders—so that's one feature I did get. The boiler should be of 3½-in. copper tubing, but that cost \$3.50 a foot, whereas I could get 4-in. steel tube for 40c. a foot here at work. All sheets were arc welded by one of our welders in about two hours. This was tested to 250 lb. after rolling

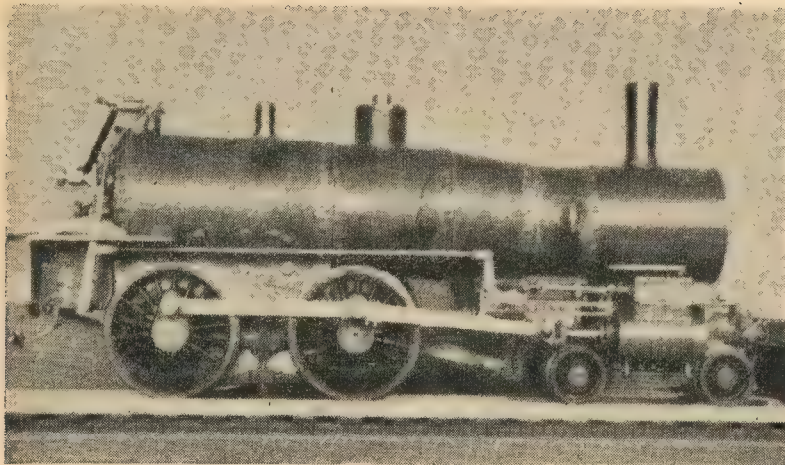
in the copper flues. All honour to those brave and patient souls who rivet and braze their boilers, but my job does not permit taking time for that method.

Valve-gear used is the Baker "long travel" type, which I consider ideal for a model. True, there are a number of small parts, but these are quite rugged and interesting to watch. This gear also takes a large crank circle, but again is more spectacular and less sensitive to wear. The lubricator is not of orthodox design, but was copied from a commercial job manufactured here in

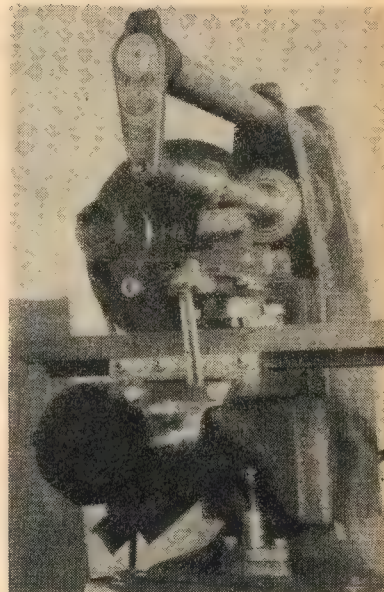
Right: Chapman's steam outboard motor, 4-cylinder, single acting. Piston valves, with swing eccentric for cut-off and reverse. Crankshaft on ball and Hyatt roller bearings. Welded steel propeller 14 in. x 18 in.

Below: This print shows one of the early type "Hudsons." They were improved as time went on. Baker valve gear replaced Walchaert and coffin feed water heater replaced Elesco, etc. Large trailer wheels had a "booster" engine to help starting





Above: Bill Goesch's Standard $\frac{1}{4}$ -in. scale loco, and right, his milling machine



Minneapolis. It is very simple, does not use a ratchet, and feeds uniformly. Will give details if it works well. The tender has a hand pump, but I am trying to build a small steam pump with toggle acting valve, and I intend to fit an "L.B.S.C." injector I got from Kennion Bros.

Fortunately, I was able to photostat the builder's drawing from the *Locomotive Encyclopedia*. Please do not compare my model with the drawing, however. The similarity of this drawing to the one furnished by Bond's for their

"Pacific" is interesting. The New York Central used to buy these Hudsons in groups of fifty before the diesel craze hit. The last ones built were well streamlined, had Timken roller bearings on all axles, side and main rods, and "needle" type bearings in valve-gear. They were refined until they would develop 5,000 h.p. which gave better than 1,600 h.p. per axle. This is the highest h.p. per axle of any engine

built over here that I know of. Of course, by now diesels, or "growlers," have taken over many main line runs. But Old Man Economics steps in here. Diesels are too expensive to use on the branch lines, where they run up in the evening and lay over all night. So here
(Continued on page 432)

For the

BOOKSHELF



Under Four Flags, by Capt. H. W. Edwards, R.N. (Ret.). (London: Percival Marshall & Co. Ltd.). Price 10s. 6d.

This is a refreshingly readable little book with few heroes; in fact, one is at the end surprised to realise how easily the author has carried us through forty-six years of his life, from his time as a boy in a Norwegian barque at a shilling a month, his regular apprenticeship in sail, service as forecabin and officer in the Blue Anchor Line, B.L., P. & O. and R.M.S.P., to his eventual turnover from his comparatively senior rank in the merchant service to be a very junior lieutenant in the Royal Navy. From there he leaves something of a blank until we find him as a full captain during the war; it is to be hoped that he intends to give us another volume with more information on the naval side of his career.

At no time is one bored by detail, and Captain Edwards gives us some very interesting descriptions of obtaining a shanghaied crew from the boarding-house keepers of Portland, Oregon, during the '98 gold rush, of the nitrate trade, and of the early naval experiments with ship-borne aircraft under the guidance of Daredevil Sampson and the Short Brothers. I should have liked to hear more of the red-bearded Commander Sampson. Other cleverly-done vignettes give us glimpses of a "black nor'easter" off the Horn, of a Patagonian pampero and of the gunnery school at Whale Island in 1911, when it was considered black heresy to apply for leave to get married!

Captain Edwards, having given us such an eminently readable book, it may seem a little ungracious to level criticisms, but that, after all, is one of the duties of the reviewer. The French company of A. Bordes is referred to on page 36 as "A. Bord"; the photograph of the five-masted barque *France* facing page 64 is captioned as "four-masted barque"; on page 141 *Ormaru*

is misprinted for *Oamaru*; in the glossary the luff of a sail is described as being that part nearest the mast—misleading, I think, if applied to squaresails or staysails! Thank goodness the gallant captain is only once guilty (on page 131) of employing the solecism "knots per hour."—W.H.

Elements of Mechanism. By V. L. Doughtie and W. H. James. (London: Chapman & Hall Ltd.) 494 pages, $8\frac{1}{2}$ in. $\times$ $5\frac{1}{4}$ in., with numerous line drawings and half-tone illustrations. Price 48s.

The objects of this book are to explain the application of fundamental physical principles to the design of mechanism, and to analyse and explain these elementary functions as applied to practical engineering problems. It begins with the basic study of motion, analysis of velocity and acceleration, linkages, and transmission of motion. Subsequent chapters deal with cams, gears, belts, ropes and chains, and follow up with gear trains, miscellaneous mechanisms and laboratory problems. Written by two American university professors, this book is not for the mechanical dilettante, but will undoubtedly be of great value to the serious student and practical machine designer.

Practical Television Circuits. By F. J. Camm. (London: George Newnes Ltd.) 288 pages, $4\frac{1}{2}$ in. by $7\frac{1}{2}$ in., 156 illustrations in line and half-tone. Price 15s.

This book gives wiring diagrams and constructional details of a number of tested T.V. receivers suitable for amateur construction, ranging from the simplest and most inexpensive type to more elaborate large-screen receivers. It contains, in addition, chapters on the construction of auxiliary equipment and test apparatus, also on aerial design and erection.

Camera—Tips for Everyone. (London: The Fountain Press.) Price 1s. 6d.

The inexperienced amateur photographer who wishes to obtain the best possible results with limited or inexpensive equipment will find this little book very useful. It gives advice on all branches of photographic work, including outdoor and indoor portraiture, landscapes and seaside views, also "camera drill" focussing and exposure. The illustrations include several photographic plates of typical subjects.

Next Week

MODEL CARS AND POWER BOATS

Reviews of the models in these sections of the "M.E." Exhibition are given by specialists in the respective fields of activity.

A COMPRESSOR UNIT

The articles on the construction of a vee twin compressor, continued by "Duplex."

EARLY MORNING TEA

A reader describes his experiences in constructing the Automatic Tea Maker from an earlier article published in the "M.E."

MAKING GEAR CUTTERS

The processes involved in producing involute gear cutters, including correct forming and backing off, described by H. Winton.

"TITFIELD THUNDERBOLT"

Such items as splashers, footplates, fenders and other "trimmings," necessary to complete the effect, are discussed by "L.B.S.C."

A STEAM "PARTY"

Something very unusual, so far as "parties" are concerned, but the idea may possibly grow after this description of such an event has been published.

Clocks at the “M.E.” Exhibition

By Claude B. Reeve

THERE were four clocks in the competition section of the Exhibition this year. The electrically wound skeleton clock by Mr. G. J. Warren of London, N.17, was clockmaking *par excellence*, for it is doubtful whether any clock seen at previous exhibitions has shown such quality of finished workmanship. It is to be greatly regretted that it was not shown cased and working, thus meriting a still higher award. It would be interesting to see this clock complete and working on some future occasion. It was awarded a Silver Medal and the Reeve prize.

The Hipp type electric clock exhibited by Mr. A. E. Bowyer-Lowe of Letchworth was very scientifically constructed, and it was evident that a great deal of preliminary experimental work was undertaken before the final construction of the movement could be achieved.

The construction of the pendulum is on regulator lines, with the bob resting on a fixed pin, and a tray is fixed on the pendulum rod for holding the small timing weights; a Silver Medal was awarded to this exhibit.

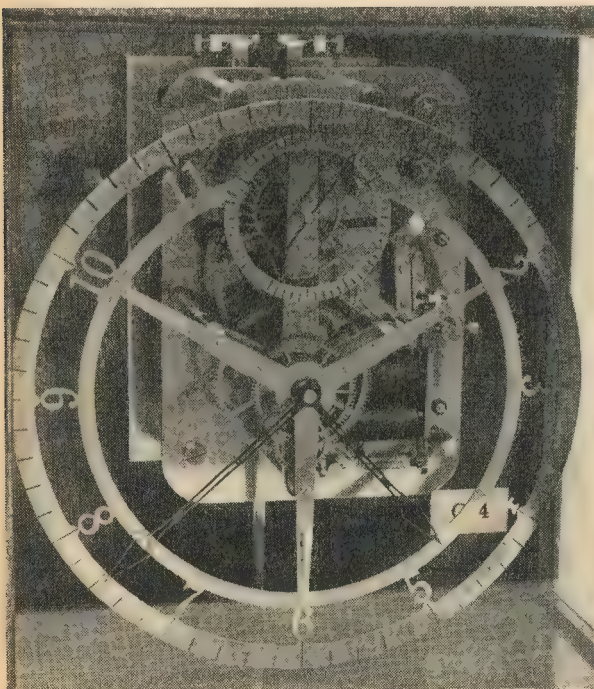
The two electric clocks with semi-free balances exhibited by Mr. W. E. C. Garlick of Grimsby and Mr. J. W. Ramsbotham of Acton, W.4, were so very much alike that one would have thought that these two exhibitors were very close neighbours rather than residing 150 miles apart.

Both clocks showed excellent workmanship. One wonders whether the advantages of the bi-metal and cut balances are outweighed by other certain disadvantages inherent in this type of clock. In the case of Mr. Ramsbotham's clock, it would have been nice to see smaller screws in the cock of the motion work; the hands, however were very beautifully finished. Mr. Garlick's perspex dial in the modern style was very effective, and allowed a clear view of the movement; each clock received a Bronze Medal.

The Hipp type electric pendulum clock exhibited by the fifth form students of the Technical High School, Cheltenham in “The Model Engineer” Students' Cup class showed great promise and care in its construction, and was awarded the Exide and Drydex Challenge Cup.



The half-seconds Hipp type electric clock by A. E. Bowyer-Lowe



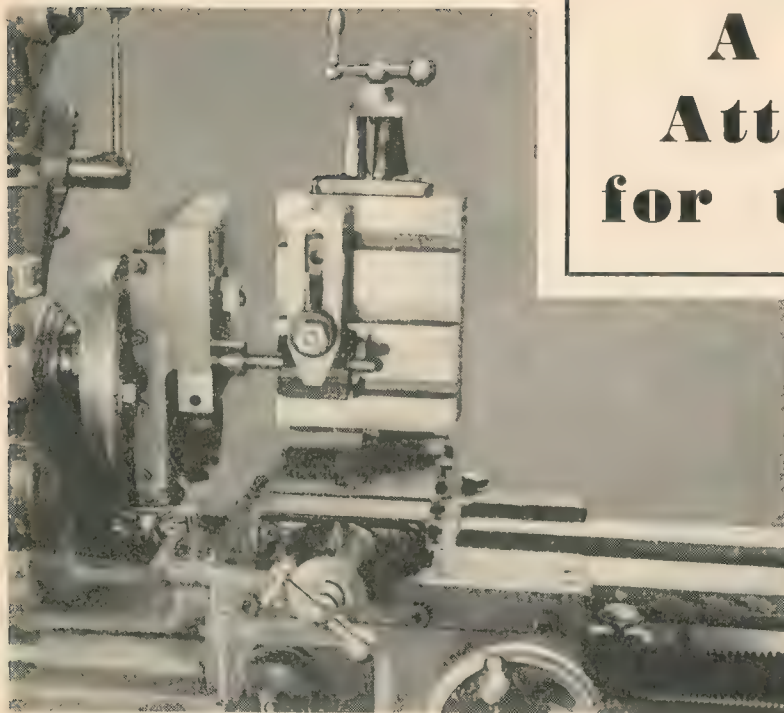
An electrically-wound seconds pendulum skeleton clock, by G. J. Warren



Another electric clock with semi-free balance. (J. W. Ramsbotham)

A Boring Attachment for the Lathe

By J. Dunn



The boring attachment in use, boring a cylinder casting set up on the vertical slide

A BORING head has many uses in the lathe for doing those awkward jobs which sometimes cannot be done in the usual way, such as, perhaps, machining a bedplate which cannot be swung when mounted on the faceplate, or turning and facing the ends of a shaft, too long for the lathe and too large for the hollow spindle. It can also be used for boring and facing cylinders, etc. For jobs such as these, I made the following gear, and have since found it very useful.

Briefly, the idea consists of bolting the compound rest to the faceplate or catchplate, and using it as a boring head, after the style of a horizontal borer, and mounting the work on the vertical slide or boring table. The gear described was made for a Myford M.L.7 lathe, and sizes given are for this lathe, but no doubt, it could be adapted to almost any lathe. No claim is made that it is better than the conventional method of turning, but sometimes it may be the best, or even the only, way of machining a certain job.

First to be made was the tool bar holder, which is bolted to the top-slide by a short bolt, used in place of the standard tool clamping bolt.

A piece of scrap steel $2\frac{1}{2}$ in. $\times$ $\frac{7}{8}$ in. was found, so this was cut off 4 in. long, and faced on both sides in the 4-jaw chuck. The sides were then machined to the width of the top-slide $2\frac{7}{8}$ in., and the ends faced for the sake of appearance. A slot, $\frac{1}{2}$ in. wide and

$1\frac{1}{2}$ in. long, was drilled and end-milled as shown in the sketch.

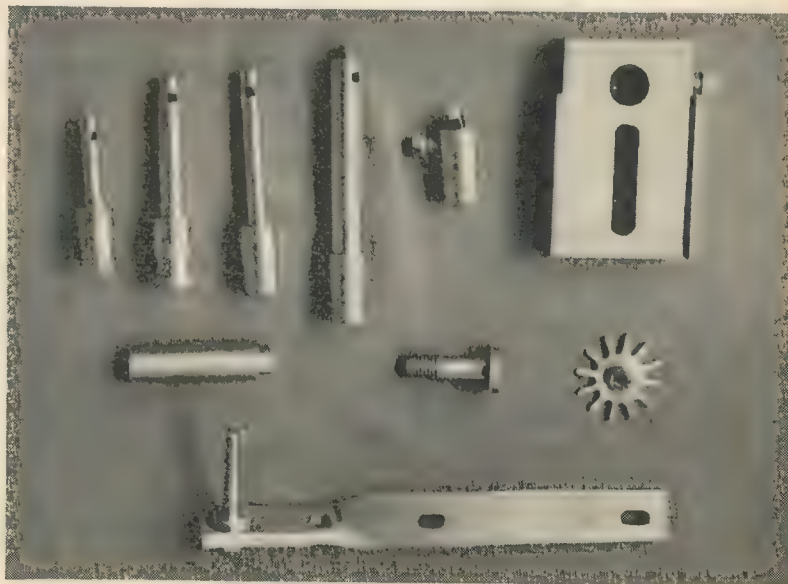
So that there would be no possibility of the block turning on the central bolt, two pieces of 1 in. $\times$ $\frac{1}{4}$ in. steel, 3 in. long, were brazed along each side, or they could be held on by set-screws. The block was then cleaned up by

filig, so that it was a fairly neat fit over the tool clamping face of the top-slide, and then polished with emery cloth, for appearance.

A bolt was made, as shown in the sketch, to replace the standard tool clamping bolt.

A spigot-pin, for locating the compound rest on the catchplate, was made by turning a No. 2 Morse taper to fit the lathe mandrel. This was then inserted in the mandrel, and the outer end turned to a diameter of $\frac{1}{2}$ in., to fit the hole in the centre of the compound rest, the spigot-pin of which is driven out.

The compound rest was then mounted on the catchplate, two $\frac{5}{16}$ -in. Whit. holes being drilled and tapped in the catchplate to hold it. The tool-holder was bolted to the top-slide, with the longest part towards the top-slide handle, and a centre-line run through with a scribing block, at the lathe centre height, the mandrel then being given half a turn to check it with another line diametrically opposite.



Boring bars and other components

The centre of the hole for the tool bars was then set back $\frac{3}{32}$ in. from the centre-line, as it was intended to use $\frac{3}{16}$ -in. square tool bits, and this would bring the top face of the tool level with the centre of the work, similar to setting the tool at the correct height in normal turning. The hole, for the tool bars, was then bored out to $\frac{1}{2}$ in., and the hole for the locking screw drilled and tapped $\frac{5}{16}$ Whit., for a case-hardened set-screw.

For feeding the tool in or out, when facing a job, a star wheel with 12 teeth was cut from a piece of $\frac{1}{8}$ -in. plate, and a $\frac{1}{4}$ -in. B.S.F. nut brazed in the centre. It should be made as large as possible, just to clear the gap in the lathe bed.

To engage with the star wheel, a stop pin was turned as shown in the sketch, with a couple of flats filed on the collar to stop it turning while tightening the nut underneath. It may be found necessary to file a flat on each side of the pin, as there is not much clearance between the dial index and the gap when the compound rest is mounted.

For carrying the stop pin, a piece of 1 in. $\times$ $\frac{1}{2}$ in. steel bar was used, held to the back of the lathe bed by two $\frac{1}{4}$ -in. B.S.F. set-screws, in the holes for the taper turning attachment. The bar was heated to a bright red and twisted through about 70 deg., the twisted part also being offset, so that the bar

can fit flush against the back of the lathe bed. Holes were drilled and slotted for the $\frac{1}{4}$ -in. B.S.F. set-screws, to allow for some small end adjustment, and two $\frac{5}{16}$ -in. holes drilled in the twisted part, as shown, to carry the stop-pin, which should fit up in the gap, radial to the mandrel centre.

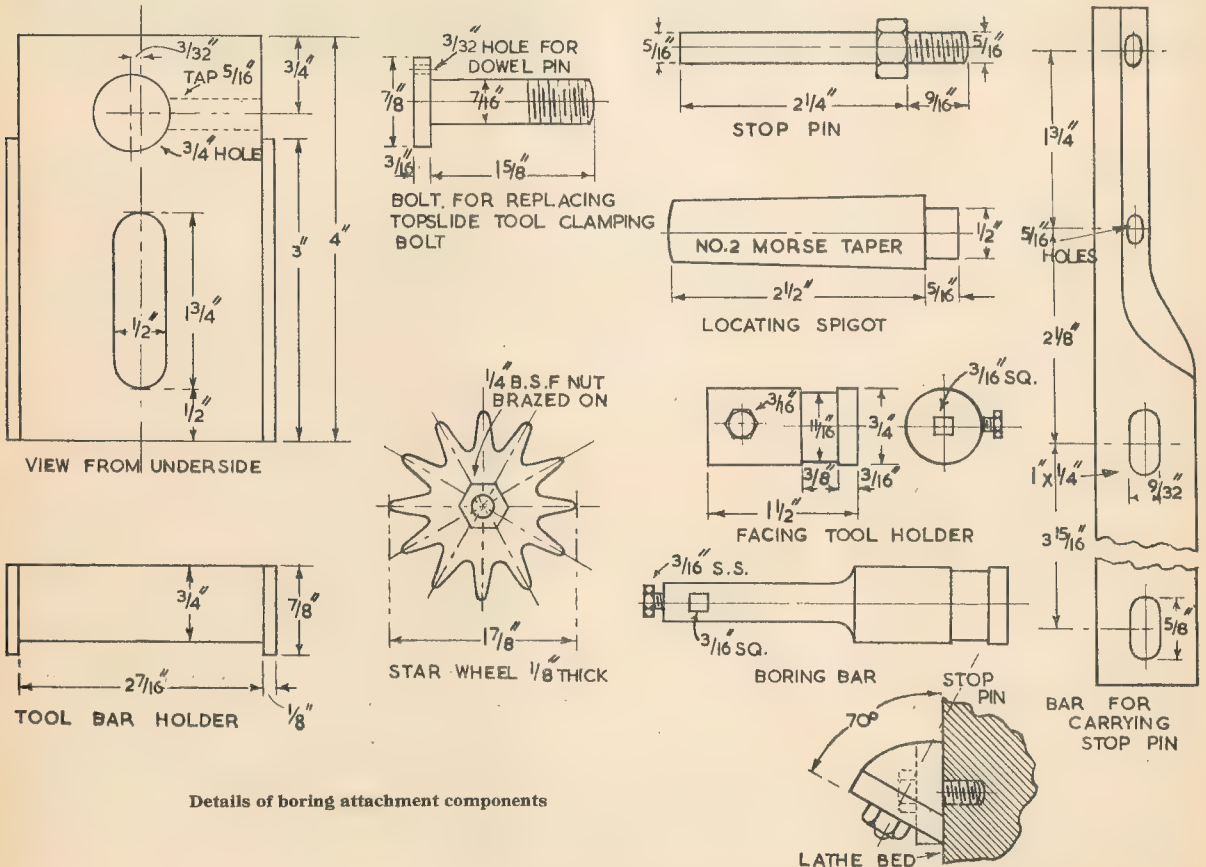
A facing tool-holder was made, as shown, a $\frac{17}{64}$ -in. hole being drilled half-way through, then a $\frac{13}{64}$ -in. hole for the rest of the way. A square was roughly filed in the smaller hole, then finished off, by squeezing a square ended piece of $\frac{3}{16}$ -in. square tool steel through, in the vice, from the larger hole. This hole was drilled about $\frac{1}{32}$ in. off centre, so that, if necessary, some adjustment could be made to the height of the tool, by revolving it a quarter or half a turn. This would be useful if the top of the tool was worn down.

A few boring bars of various sizes were made. After these parts have been made, the gear can now be set up ready for use.

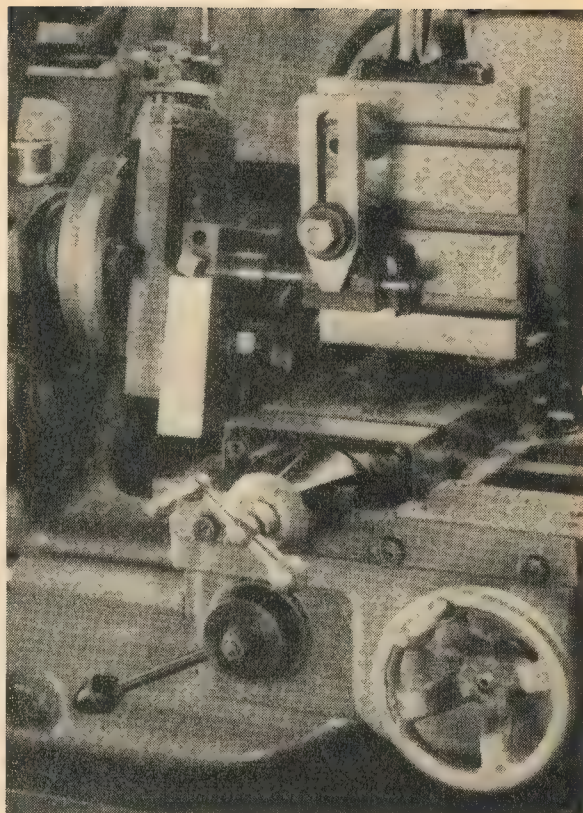
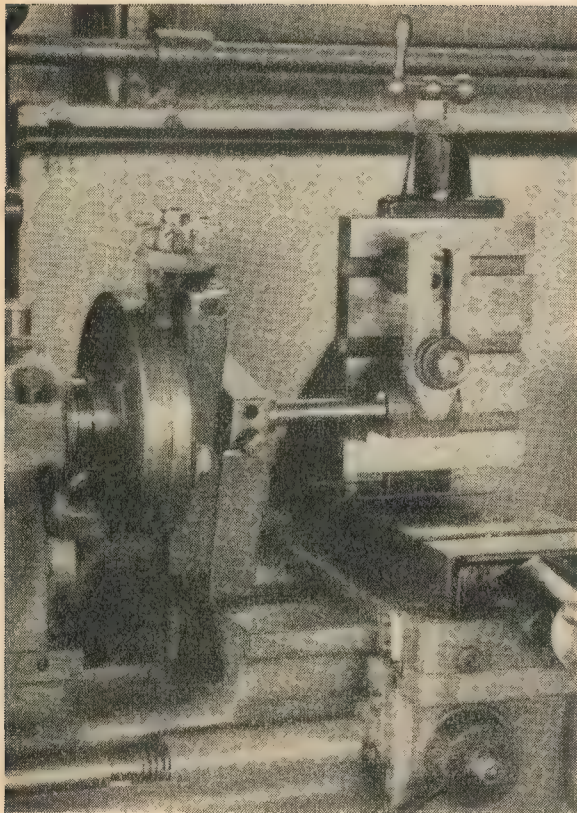
The catchplate is mounted on the mandrel, and the locating spigot inserted in the taper. The spigot-pin, in the centre of the compound-rest, is driven out with a piece of brass, and the compound rest mounted on the catchplate, held by two $\frac{5}{16}$ -in. set-screws. The standard tool clamping bolt is taken out



An external machining operation with the attachment



Details of boring attachment components



Two views of the cylinder boring operation in progress

of the top-slide; it just taps out, and the short bolt put in its place. The tool bar holder is then bolted to the top-slide with the tool bar hole towards the top-slide handle. The handle is unscrewed, and the star wheel put in its place, the index dial being left on.

If being used for boring or external turning, a suitable boring bar is inserted in the holder and locked by the set-screw. The tool can then be adjusted by means of the top-slide spindle and dial index, which is much easier than setting the tool in the ordinary type of boring bar, used between centres.

If being used for facing, the facing tool holder is fitted, and the bar and stop pin fitted to the back of the lathe bed. The stop-pin engages with the star wheel at each revolution, and feeds the tool in or out, according to whether the pin is fitted in the hole nearest the headstock or tailstock.

The 12-tooth star wheel gives a slightly coarse feed, and it may be better for some purposes if a star wheel with a greater number of teeth is used, provided there is room between the teeth, for the stop pin. In this case, it may be necessary to reduce the diameter of the pin slightly.

When using the attachment, it is best to tighten one of the adjusting screws in the cross-slide gib, and in the vertical-slide, to hold them firm, and to use light cuts at a fairly slow speed. Top

speed in back gear is suitable for most jobs.

Practical Applications

The photographs show the gear set-up, and some applications of it. An old cylinder is shown being machined. After the frame bolting face has been dealt with, all the other faces can be machined, without removing from the vertical slide table, the valve face being

milled. Then the table is swivelled 90° deg., the cylinder bored, and flanges faced at both ends, at the one setting.

Another photograph shows a piece of shafting being faced and turned on the end, the outer end being supported on packing.

It may also be possible to do screw-cutting, although, because of the lack of side adjustment of the tool, it would be difficult, except for fine threads.

LIVE STEAMERS IN THE NEW WORLD

(Continued from page 428)

steam is still used extensively. Of course, where railroads own oil wells, as many do, or where water is bad, as out west, steam is at a disadvantage. Five years ago, during a visit to "fair London town" I procured a set of parts for a Mogul "O" gauge locomotive at Messrs. Bassett-Lowke. This was pure pleasure to assemble, and has provided many happy hours for numerous "small fry" cousins and nephews. I have added an automatic whistle which toots each time around the track, also a tender tank for spirit to give longer runs. About the only trouble is keeping decent paintwork on her. I am consider-

ing baked enamel, or even plating her, as she is still in good mechanical shape after five years use.

Along with these interests, I am attempting to build a steam outboard motor for a boat. This is a four-cylinder radial job with piston valves, reverse gear, steam driven pump, and oil-fired flash boiler. Hope to "get her feet wet" this summer, and will report results if others are interested.

Time and space do not permit telling of other fellow-engineers here in Minneapolis, but we four are typical examples of British Model Engineering Influence.

Making a Triangular Scraper

By "Duplex"

THE triangular scraper is a most useful workshop tool for removing the sharp edges from the mouths of machined bores or for scraping concave surfaces generally. The small scraper illustrated in Fig. 1 was recently used successfully for bedding in a pair of brasses to a 2 in. diameter shaft.

To enable sharp cutting edges to be formed and maintained during use, a good-quality carbon steel is essential for making the tool, and a discarded triangular file of best make will serve this purpose well. A file of fine cut should, if possible, be selected, as this will reduce the amount of grinding necessary to remove the teeth and form the cutting edges.

For small work, a 4 in. file will be found quite large enough, but a 6 in. or 8 in. file is more suitable for larger work where a better hand-hold is needed.

Before starting to grind the file, it should be fitted with a comfortable form of handle so as to provide a firm grip for controlling the tool. Although we have ground these scrapers free-hand quite successfully, this requires some care, as there is then the danger of getting the file wedged in the gap between the rest and the grinding wheel. It is advisable, therefore, to hold the

file in some form of grinding jig and, at the same time, to grip the handle firmly for guiding the tool across the wheel.

Grinding the Cutting Edges

As shown in Fig. 2, a small, Starrett-pattern, machinist's clamp forms a convenient grinding jig. The cutting edges are formed in the three successive stages represented in Fig. 3. First, as in Fig. 3A, the three corners of the file are ground until all the teeth have been removed, and even flat lands are formed. To do this, the file is gripped in the clamp with one flat surface away from the wheel, and the grinding rest is adjusted to bring the edge of the file exactly on the centre-line of the wheel, as shown in Fig. 4. Next, the handle is gripped firmly in the right hand, and the left hand is used to guide the clamp while the file is moved across the peri-

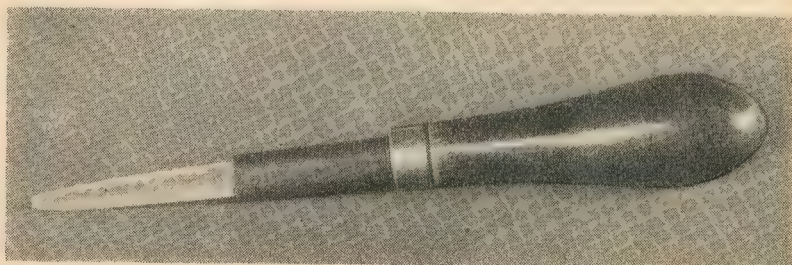
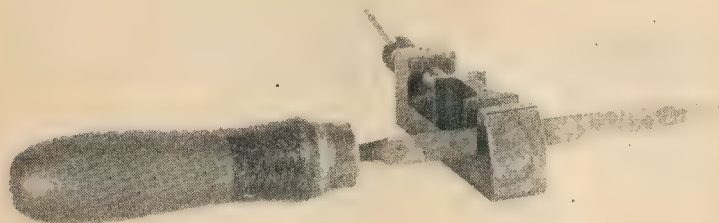


Fig. 1. The finished triangular scraper

Left Fig. 2. A clamp used as a grinding jig



phery of the wheel, so as to follow the existing curvature of the edge. This is repeated until all three edges have been evenly ground.

In order to reduce the file to the shape represented in Fig. 3B, a second operation is needed to grind a hollow curvature along each of the three flat sides of the file. For this purpose, as shown in Fig. 5, the file is turned in the clamp with one flat towards the wheel; this will bring the centre of the flat to the centre-line of the wheel, and the grinding rest will not have to be reset. The hollow-grinding need not be very deep, as this would weaken the cutting edges, and a wheel of about 6 in. in diameter will form a suitable curvature.

The grinding is continued until the edges of the hollow fall just short of the previously ground edges, and the two remaining sides of the file are dealt with in the same way.

As the heat produced during grinding will not be quickly conveyed away from the thin cutting edges, great care must be taken not to overheat the steel and draw the temper. The grinding must not, therefore, be hurried, and ample time should be allowed for the metal to cool; on no account should the tool be cooled by dipping it in water, as this may cause hair cracks in the steel and spoil the cutting edges. Should a so-

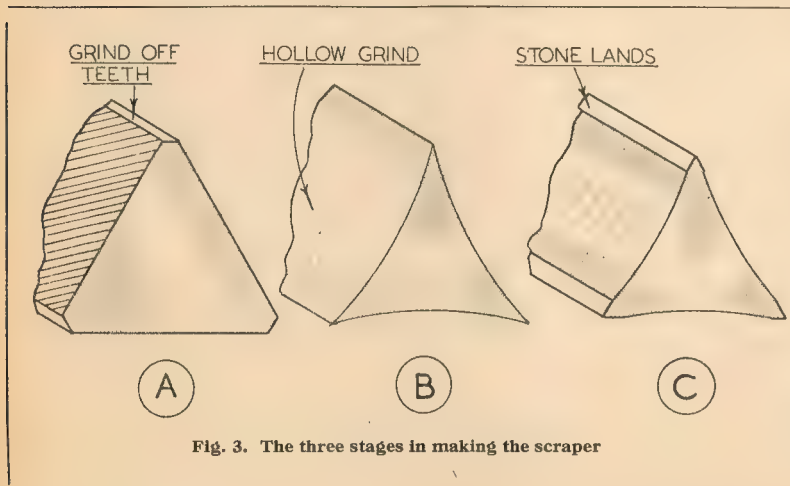


Fig. 3. The three stages in making the scraper

called feather edge form during grinding, this can be broken off by drawing the edge over a piece of brass; the old-time razor blade grinders were in the habit of using a piece of horn for this purpose, as the edge was much more delicate.

Honing the Edges

The final operation to form keen, even cutting edges consists in honing the scraper on an oilstone, and the effect of this will be to form flat lands where the edges meet, as shown in Fig. 3C. Although a hard Arkansas oilstone will, perhaps, produce the finest form of cutting edge, an India stone of fine or medium grit is much quicker acting and will form a very good edge. During the honing operation, the scraper is kept lying flat on the stone, and is held somewhat obliquely, as represented in Fig. 6; the tool is then moved to and fro along the long axis of the stone and the handle is gradually raised in order to hone the cutting edges up to the point.

Honing is continued until all three edges feel sharp, when tested in the usual way with the finger or drawn against the thumb nail. When blunted, the hollow-ground edges can be quickly restored by a few strokes on the stone, but once the ground surface has become obliterated, it is advisable to hollow-grind the tool again in order to lessen the work of honing and to promote free-cutting.

When using the scraper, it will be found to cut freely on concave surfaces, if any two of the cutting edges are held flat to the work surface. Avoid using the scraper as a reamer to cut simultaneously on all three edges, for if the tool is forced into the work, the hardened and somewhat brittle cutting edges may easily be chipped and damaged. As shown in Fig. 1, a short length of rubber tubing has been slipped over the base of the tool, to prevent the sharp edges cutting the fingers, but this sleeve should be removed when resharpening the scraper.

The Half-round Scraper

This tool is mostly used for the same purposes as the triangular variety, but it has the disadvantage of having only one edge for cutting in either direction.

The scraper is best made from a discarded, half-round file, and the cutting edges are ground in much the same way as in the previous example. However, when grinding the edges of the file, the height of the tool-rest must be adjusted so that a rake angle of some 5 deg. is formed in accordance with Fig. 7.

For carrying out the hollow-grinding, the grinding rest may need resetting in order to bring the centre of the flat surface of the file into line with the centre-line of the wheel.

After the two cutting edges have been ground, the flat surface of the scraper is finally honed in the same way as the triangular counterpart.

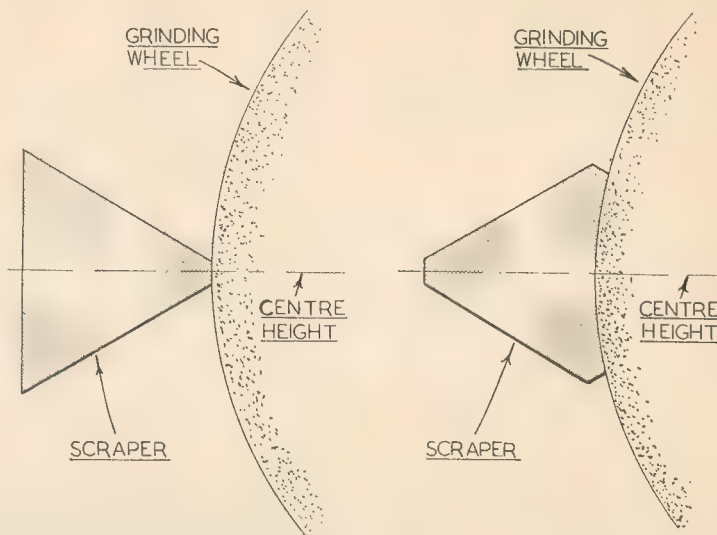


Fig. 4. Grinding the edges of the file

Fig. 5. Hollow-grinding the flat surfaces of the file

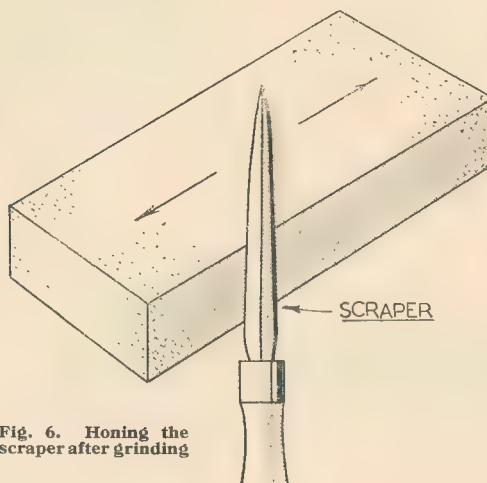


Fig. 6. Honing the scraper after grinding

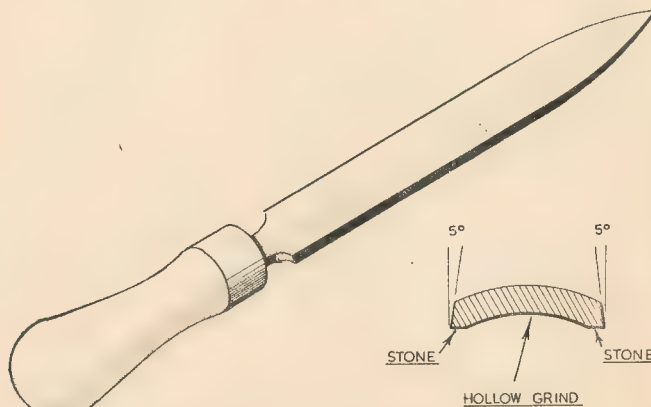


Fig. 7. A scraper made from a half-round file

READERS' LETTERS

MODEL BOILER MAKING

DEAR SIR,—I have just finished reading "Gasbag's" article on boiler building and frankly I'm terrified.

I feel sure many others will consider hastily scrapping those terribly flimsy designs of "L.B.S.C.'s," untutored designs which may burst at any moment!

I am only a simple soul who trusts implicitly in text-books, and they tell me that when calculating bursting and other pressures for copper pipes I should use the following:—

$$25,000 \times \text{Plate thickness} \times 2$$

Barrel dia.

and that to arrive at material thickness one should say that:—

$$D \times WP \times F$$

Stress $\times 2$ in.

where D = Dia. of barrel,

F = Safety factor of from $6\frac{1}{2}$ to 8, and S = 25,000.

As I am rapidly coming to the point where I must consider boiler design for the Chesapeake *Berkshire* I am building in $1\frac{1}{2}$ in. scale, I hesitate to think what would be the result of adding more weight to the chassis. The boiler, I may add, is larger than the one discussed, being of 11 in. diameter; the weight in $\frac{1}{4}$ -in. material would be colossal.

My figures show that $5/32$ -in. material gives ample margin for safety; to consider anything larger, NO!

Copper welding and Sifbronze offer many advantages over rivets and, I venture to suggest, require no elaborate after-treatment. In this, I feel sure, the welding companies would only be too ready to offer technical advice.

Does "Gasbag" seriously suggest that we as modellers should take factors of 8? How many times do we work our boilers really hard?

As a point of interest, at one time during my work to check safety points of copper pipes used for hydraulic lines, many were tested to destruction; the pipes were normally carrying a pressure of 300 lb. with surges of anything up to 900 lb. The pipes were 1 in. o.d. and 16 g.; they gave, as a general figure, a burst point of 1,900 lb., a figure of twice their maximum expected working pressure.

I am not suggesting we should come down to this figure, but I do think we should review the matter in a more realistic light, even if we have to get the article past the insurance inspector.

Please do not think I am in any way decrying "Gasbag's" article; I am not, but I think he should reconsider his presentation, as many would-be modellers may be frightened off.

My best wishes to him; may he be

persuaded to write another article, as I am sure all readers of your excellent paper will agree we have too few articles of this nature.

Yours faithfully,
Chislehurst. A. C. BRODIE.

THE LOCOMOTIVE OF THE FUTURE

DEAR SIR,—I read "L.B.S.C.'s" article in the June 17th issue with much interest and amusement. However, in my own eyes, this type of locomotive would tend to be a locomotive of the past rather than of the future.

In a recent edition of the *Engineer* there was a description of a new locomotive that has just been built for the Norfolk and Western Railroad, this may really be classed as a locomotive of the future, being a steam turbo-electric locomotive. I am not sure of the details, but I do know that it has a coal-fired Babcock and Wilcox boiler, which steams an impulse turbine, and the propelling bogies are interchangeable with those from diesel locomotives.

Some locomotives of this type were built by the Baldwin Locomotive works and the Westinghouse Electric and Manufacturing Company for the Chesapeake and Ohio Railroad, and were of a 4-8-4-8-4 wheel arrangement. The coal for these locomotives is carried in front of the cab, the boiler and turbine being behind the cab; at the back of the locomotive was a twelve-wheel tender containing feed water. As a drop in coal weight would reduce the factor of adhesion, an auxiliary water-tank was placed under the coal bunker, so that water could be pumped forward as weight in coal dropped, to compensate for the weight reduction.

A locomotive of this type would have

a much higher thermal efficiency than that of a normal reciprocating locomotive, and the costs of running and maintenance would be much lower, although the initial costs of construction would be much higher.

Surely, a locomotive of this type might be built by British Railways as an experiment? Most of the locomotives they have built so far, have been rather disappointing, being just a variation on an old theme, as the gas turbine locomotive appears to have been the only big step forward for some time.

I believe that there is too much sentiment attached to the old type of locomotive, and sentiment won't improve their design or efficiency.

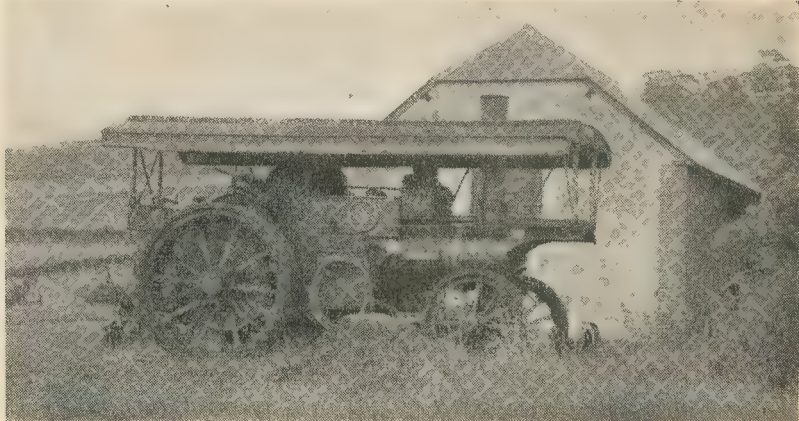
I would like to thank Mr. Westbury for the splendid job he is making of the "Utility Steam Engine" series, and I wonder if he might consider describing a model steam hammer that could be easily constructed.

Yours faithfully,
Beckenham. THOMAS SHERIFF.

A BURRELL IN DORSET

DEAR SIR,—As there is so much interest nowadays in the preservation of old traction engines, of which few examples remain nowadays, I thought the photograph I took (July 4th) about one mile north of Bere Regis, Dorset, of a Burrell road locomotive, would be of interest. It appears to be in working order, as I noticed that the gears were well greased and it had a road licence for this year. I do hope that some individual or club will come forward and preserve it, when the present owner has no further use for it.

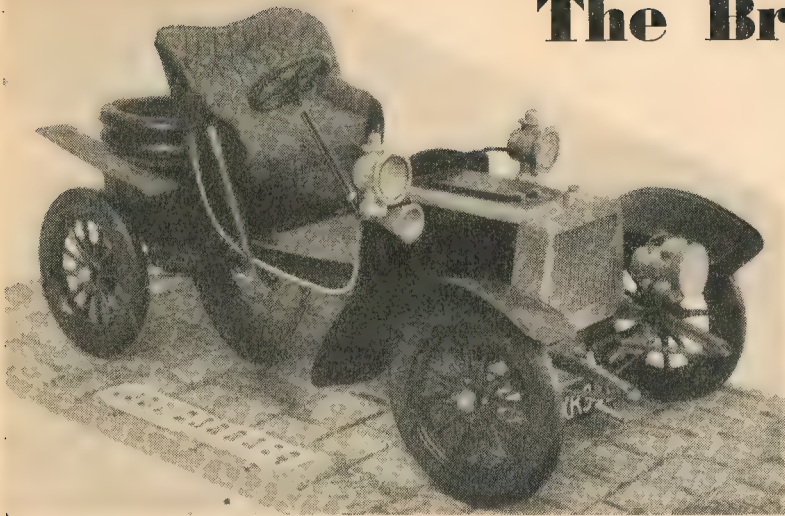
Yours faithfully,
Swanage. H. E. RENDALL.



The Burrell photographed by Mr. Rendall

The Brighthouse Exhibition

Reported by
"Northerner"



Inch-scale model of a film-star: "Genevieve," built by R. Nobbs, of Halifax

THIS year the Brighthouse S.M.E.E. held their Exhibition at a hall in Halifax, which may seem rather peculiar. Nevertheless, the explanation is simple, because more than a third of the Society's members live in Halifax, and were thus able to display their work on their own doorstep, so to speak.

The premier award at the exhibition was the Amos Barber Trophy, inaugurated by the societies who are members of the Yorkshire Association of Model Engineers, to commemorate the late Amos Barber of Bradford, whose superlative craftsmanship has been, and will continue to be, an inspiration to so many of us.

This trophy is open to all members of the Yorkshire Association, and was won this year by J. H. Hainsworth of Leeds for his $\frac{1}{4}$ -in. scale "Green Arrow." Since this engine was described and illustrated in my report of the Leeds Exhibition (*THE MODEL ENGINEER*, dated May 20th, 1954), however, there is no need to repeat myself, but I feel sure that Mr. Barber himself would have approved the award. This engine also won First Prize in the locomotive section.

Second prize-winner was D. W. Horsfall of Brighthouse for another "Green Arrow," which many readers will have seen at the London Exhibition, on the stand of the Densford Engineering Co. Mr. Horsfall also exhibited a chassis for a N.E.R. Class "O" 0-4-4 locomotive to $1\frac{1}{16}$ -in. scale, which had an excellent finish in both mechanical detail and paintwork. The former included Stephenson link-motion with balance weights on the weigh-bar shaft, correct braking, and split bushes to the big-ends, with strap and cotter attachment.

Another nice engine with a good finish was *Pamela*, a "rebuilt" S.R. Pacific by R. Horsfield of Brighthouse. I saw this locomotive at work on the

track, where she made light and easy work of her load. H. Byram of Brighthouse also ran his 5-in. gauge dock shunting engine *Wagtail* on the track, and I had the pleasure of driving her for a short period. A sturdy free-lance 0-4-0, she was based on a photograph of an engine called *Tailwagger* published some time ago in *THE MODEL ENGINEER*, and she too was an excellent performer.

Marine Models

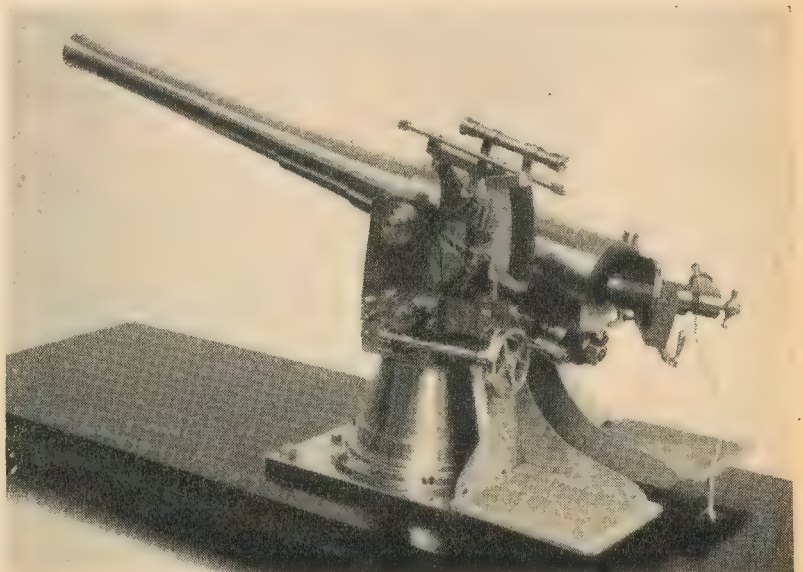
George Harrison, ebullient secretary of the club, had to put up with a great deal of leg-pulling about "bribery and corruption" when he was seen to pay

for a cup of tea for one of the judges, for he won several awards including the Miller Trophy for the best model by a Brighthouse member.

This was for his auxiliary engined schooner, also winner of the First Prize in the Yacht section. The hull is built bread-and-butter fashion, on the buttock lines, and is finished in light and mid-green enamel.

Deck and cockpit are planked in mahogany and walnut veneer, on a foundation of thin ply, and the "auxiliary engine" is one of those excellent Adamcraft electric motors (now, alas, no longer available) externally disguised as a Perkins marine diesel engine. The details were well made and finished, including bottle-screws to the stays, neat mast-rings, and proper goose-necks and other mountings for the yards.

George won another "First" with his cabin-cruiser, which was illustrated on page 15 of July 1st issue. Based on a river-boat built by Bates' yard, this hard-chine cruiser has a plywood skin on frames and stringers. As in the schooner, the deck and cockpit are planked in veneer, and the fittings are



With an exceedingly good finish, H. Lightowler's naval gun created much interest

well-detailed, including dashboard and wheel, seats, lights, cleats, and so on.

As I have seen for myself at Ravenssprings Park, the Brighouse H.Q., both these boats perform well, and so are doubly a credit to their builder.

First in the Junior section was schoolboy R. A. Bottomley of Brighouse with an unfinished model of a police launch. This is being built from a commercial kit, and shows considerable promise. If Master Bottomley keeps up his standard (and improves it as he gains experience), he will have more "Firsts" to his credit in the future.

R. M. Gates, another schoolboy, won both Second and Third prizes in this class, but his aircraft, though nicely built, need more attention to the finishing.

Two Motor-yachts

A 24-in. motor-yacht, to $\frac{1}{2}$ -in. scale, had been built by G. Hoyle of Spensborough with very limited equipment, and he had made a good job of her; the hull appeared to be either carved from the solid, or built bread-and-butter style, and though rather too deep for the length, the lines were shapely and smooth.

There was plenty of detail—though the side-lights faced inboard!—and the finish was quite good. Electrically driven, the boat has a speed of 2 to 3 m.p.h., and is fitted with a reversing-switch.

Two larger boats in the loan section were a 4-ft. cabin-cruiser and a model of H.M.Y. *Norge*, ex *Philante*, of about the same size. The cruiser was built by C. Forrest of Brighouse, of hard-chine construction, with the deck laid in separate planks. There were twin screws, but no engines at present.

The *Norge* is being built by H. Boocock of Colne and possesses a nicely carved hull, with good lines. Paint and varnish were not so smooth as on Mr. Forrest's boat, and the deck timber is too open-grained to be really realistic. The builder is incorporating plenty of detail, however, and when the

boat is finished, it should be a very interesting model to see.

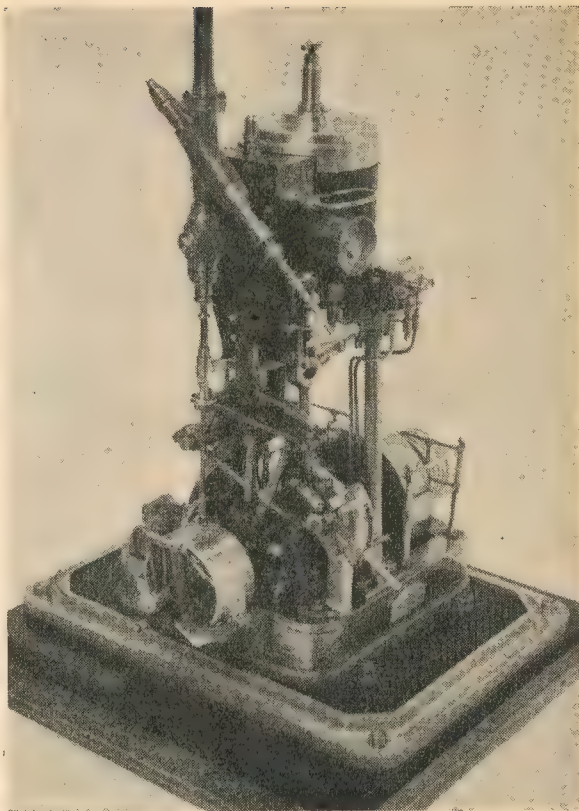
Steam Engines

A very pretty little horizontal steam-engine was loaned by Stephen H. Clarke of Richmond, Yorks., who was one of the judges of the competition classes, with W. J. Hughes as the other. The engine was not built originally by Mr. Clarke, but had been cleaned up and rebuilt, with some alterations, by him.

The design was very ornamental; for example, the turned connecting-rod was bellied out, with two turned mouldings, and the valve rocker-gear was supported on turned standards surmounted by acorns. Also belied was the eccentric-rod; there was a quadrant-type regulator, and the cylinder was lagged in mahogany. This was an engine of very nice proportions, of an ornamental style which would not find favour in these days of practical manufacture.

Mr. Clarke also exhibited a handsome free-lance vertical engine, which, as he pointed out to me, was not strictly correct in possessing Stephenson reversing-gear along with a governor. Nevertheless, as he said, he *wanted* both features, so on they went!

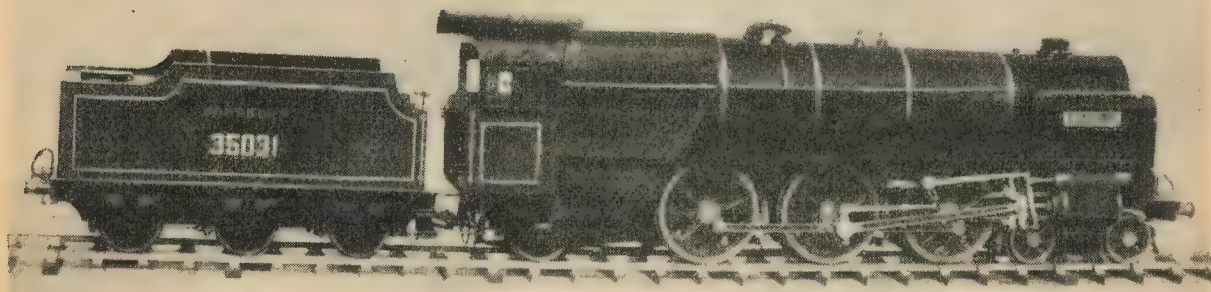
The standard of craftsmanship was



A beautifully finished vertical engine, with Stephenson link-motion built by Mr. Clarke

very high, and the detail work was extremely good. Lubrication was complete; from an oil-tank in the base, a tiny oscillating pump (driven from one of the eccentrics) delivered oil to the inclined chamber of the stop-valve. An oil-box at the front of the cylinder, with tiny screw-down valves, delivered to the cross-head and main-bearings, and the latter had separate oil-boxes also.

On the valve-chest, a pressure-gauge was fitted, and there was also a drain-



"Pamela," the S.R. Pacific "rebuild" by R. Horsfield of Brighouse, worked well on the track

cock on the chest as well as on the cylinder. The latter was lagged with mahogany, and fitted with turned false covers. Hand-rails were mounted in neatly-turned stanchions. The engine was about 9-in. high over the base-board.

Other excellent steam-engines included the twin-cylinder horizontal agricultural engine built by H. Booth of Bradford, and the free-lance mill-engine by C. Maude of Keighley, both of which have been described in previous exhibition reports of mine.

Several petrol-engines were on show, including many Westbury designs, and Dr. Fletcher's magnificent seven-cylinder radial engine of 50 c.c. capacity. Among the former were a well-finished 18 c.c. "Seal" by G. Fletcher of Barnoldswick, and a 15 c.c. "Seal" by H. Davis of Rochdale.

The latter was fully equipped, with a radiator of finned tubes mounted on a petrol tank. A centrifugal water-pump was fitted, driven from a pulley on the front extension of the crankshaft. However, the appearance of the engine itself would have been greatly improved by "cleaning-up" the castings before assembly.

A Naval Gun

One of the best-finished models in the exhibition was a naval quick-firing gun in the loan section, by H. Lightowler of Brighouse. Except for the footplates and one or two other parts which were painted naval grey, this was finished bright all over.

The barrel was approximately 14-in. long, and was rifled. It was breech-loading, with the "interrupted-thread" breech-block. Mr. Lightowler told me that the saddle and other complicated parts had all been machined in the lathe, involving much "planing."

The training and elevating movements were by steel worms working on bronze wheels, and every part of this handsome



G. Hoyle, of Spenborough built this 24-in. motor-yacht with very limited equipment

model, including nuts and screws, had been made by the builder himself.

R. Nobbs, of Halifax, had built an attractive model of *Genevieve*, the 1904 Darracq, whose exploits on the screen have delighted so many of us. The model was to 1-in. scale, and on the whole the finish was good. In places, however, more filling of grain and rubbing down would have improved matters; it does destroy the illusion when parts which represent metal can be seen distinctly to have the grain of wood.

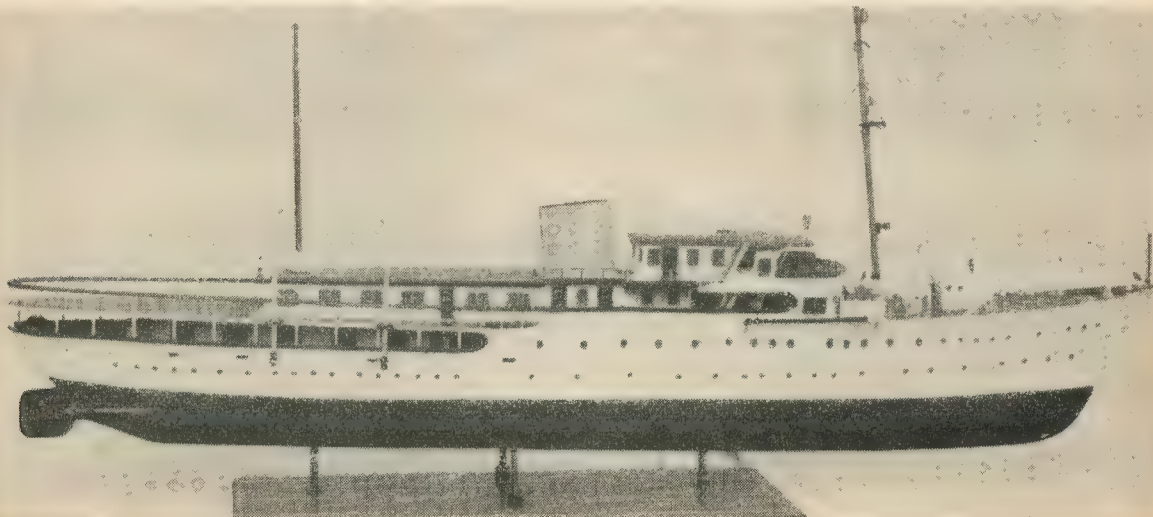
Power Hacksaw from Scrap

First Prize for a workshop tool was awarded to E. Hall, of Huddersfield, who had ingeniously transformed many otherwise valueless hunks of scrap metal into an excellent power hacksaw. The

total cost was under £1, and the machine will saw bar stock up to 2½ in. diameter.

The frame consists of short ends of channel iron and angle iron, the latter being cut from a bedstead and an old garage. Main shafts and crank-pin were machined from a bus half-shaft, and the bushes are scrap ones bored out to suit.

Gears are from a scrapped textile machine, bored out and shrunk on new centres, and the fork of the connecting-rod started life as a wrought-iron cart-axle. All machining was done on a 3½-in. lathe, the rest of the work being hard slog with hacksaw, files, and hand-drill. But as a result of his ingenuity and labours, Mr. Hall has a solid, reliable, and well-finished machine, which should give him valuable service for many years to come.



Unfinished model of the Norwegian Royal Yacht, "Norge," ex- "Philante," by H. Boocock of Colne

QUERIES AND REPLIES

"THE M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with;

- (1) Queries must be of a practical nature on subjects within the scope of this journal.
- (2) Only queries which admit of a reasonably brief reply can be dealt with.
- (3) Queries should not be sent under the same cover as any other communication.
- (4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.
- (5) A stamped addressed envelope must accompany each query.
- (6) Envelopes must be marked "Query" and be addressed to THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

Converting Magneto to Dynamo

I have an old motor cycle magneto which I wish to convert to a dynamo, hoping to obtain sufficient current to light a few miniature lamps such as those used for cycle lighting.

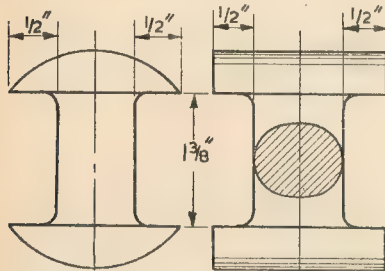
Will you please give me the approximate number of turns and gauge of wire to put on the armature? I give a sketch of the armature herewith.

W.A.K. (Worcester).

This scheme is quite practicable, but the actual output obtainable will depend to a great extent on the details of the design and the strength of the magnetic field.

We suggest that a winding consisting of 500 turns of No. 24 gauge wire will be suitable, and the cheeks of the armature should be insulated by varnished paper or silk before applying the winding.

An increase in the number of turns will produce a higher voltage, and a smaller number of turns of heavier gauge wire will lower the voltage, but increase the current output.



Enamelled copper wire will be quite suitable if due care is taken to avoid damaging the covering by abrasion. If direct current is required, the two ends of the armature winding will have to be connected to a commutator, with brushes suitably disposed in relation to the armature winding to collect the current, but alternating current can be obtained by earthing the inner end of the winding to the armature core, and connecting the outer end to the magneto slip-ring, thereby using the normal h.t. collector brush.

If only lighting current is required, as distinct from charging batteries, or any other purpose where d.c. is necessary, we should recommend the latter arrangement.

Faceplate Slots

I wish to increase the number of slots in the faceplate of my lathe which at present has only 4 slots. I find the cast-iron, however, is too hard to cut with a piercing saw, though it can be drilled satisfactorily. What is the best method of cutting the slots?

W.R.A. (Gloucester)

If the faceplate can be drilled as you state, the best way to form these slots would be to drill a number of holes fairly close together and chip or file away the metal between them.

We may mention, however, that when undertaking to produce extra means of fixing work to faceplates, it is often better to drill and tap a number of holes for studs or set-screws, rather than making slots, as this often simplifies the problem of attaching the work to the faceplate, and avoids abnormal weakening of the latter.

Tapping Fine Threads

I am experiencing difficulty in cutting sound threads when using "M.E." 40 t.p.i. taps. Will you please confirm that the correct size of tapping drill is always 1/32 in. smaller than the size of tap used in cases where the pitch is 40 t.p.i.?

E.M. (Carmarthen)

The use of a tapping drill 1/32 in. below the size of the tap is generally fairly satisfactory, but a great deal will depend on the material being tapped, and also on the condition of the drill.

In many cases, the drill may tend to cut larger than its normal size, either through incorrect grinding or the nature of the material being drilled. We suggest, therefore, that a drill one size smaller than the tapping drill should first be used, and the drill 1/32 in. below the size of the tap then used, mainly as a reamer to open out the hole to full size. The use of a suitable cutting lubricant, such as lard oil, is also very helpful for obtaining sound threads.

Precision Drilling Machines

Can you please advise me of the makers of precision drilling machines with automatic feed, capable of taking drills from 0.003 in. to 0.011 in. with or without the driving motor?

S.R. (Skegness)

We do not know of any small drilling machines with automatic feed, and we are personally of the opinion that for very small drills, it would be difficult to arrange any form of automatic feed which would not involve some risk of drill breakage, and sensitive feed is generally considered far more satisfactory.

Special high-speed sensitive drilling machines, adapted for direct motor drive, are manufactured by the following firms:—

F. Pollard & Co. Ltd., St. Saviours Road, Leicester.

The Ajax Machine Tool Co. Ltd., Green Mound Works, Halifax, Yorks.

Low Temperature Solders

Can you inform me of the lowest temperature at which solder will melt, and where I would be able to obtain low melting-point solder? Does an admixture of bismuth with solder lower the melting point? If so, where can I obtain this metal?

P.L. (Wakefield)

It is possible to obtain solders which will melt at well below the boiling point of water.

Generally speaking, solders of this type contain a certain amount of bismuth, which has the effect of lowering the melting point, and the best-known solder of this type is "Wood's Metal" which contains bismuth, lead, cadmium and tin and melts at 70 deg. C. A slightly higher melting point is obtained by using a compound of bismuth, lead and tin, melting at 95 deg. C.

Wood's Metal can be obtained from Fry's Metal Foundries, Tandem Works, Merton Abbey, London, S.W.19, but we cannot advise you where to obtain bismuth.

Converting Engine to Compressor

I have a J.A.P. industrial type engine 2-in. bore x 2-in. stroke which I wish to convert to a compressor. Can you please tell me how to lubricate the piston? Will it be automatically lubricated by splash from the sump? What pressure in pounds per sq. in. can be expected from this type of engine?

T. J. (Newcastle-on-Tyne, 1)

The lubrication system of the J.A.P. engine, to the best of our knowledge, consists of a gravity-feed system to a well in the crankcase, oil thus being picked up by the connecting-rod and splashed on to the working parts.

This system of lubrication should be quite suitable for a compressor. It should be possible to work up to a pressure of about 75 lb. per sq. in. without alteration of the working parts of the engine, but if higher pressures are required, it would be necessary to reduce clearance over the top of the piston, either by alteration of the cylinder, or by fitting a metal disc on top of the piston.

WITH THE CLUBS

Society of Model and Experimental Engineers

On Thursday, October 14th, 1954 at 7 p.m., Mr. D. H. Chaddock will give a lecture entitled "The possibilities of the working model gas turbine," at the Caxton Hall, Westminster.

Members who have seen something of the lecturer's work and methods in connection with model turbines will realise that this is a lecture of outstanding interest, and one which should not be missed.

Visitors and members of other societies who are interested are cordially invited to attend

Huddersfield S.M.E.

A successful weekend was held at our Highfields centre on September 11th and 12th, when some 70 members representing clubs over a wide area, paid us a visit and enjoyed the amenities we had to offer.

The weather was favourable on both days which enabled the track and pond to be put to good use.

Mr. J. Jones of the Maghull Society had some good runs with his hydroplanes, proving that high speeds can be attained on our pond, which is only 54 feet wide.

The ladies excelled themselves in the catering arrangements and one visitor speaking on behalf of his party thanked them particularly for a "reight good Yorkshire" welcome. Visitors to our future events can be assured of such a welcome.

The winter session of meetings commences on September 23rd, when the speaker will be Mr. W. B. Stocks, who is a local railway enthusiast. Mr. Stocks is a very interesting speaker and the title of his talk on this occasion will be "Some journeys I have undertaken."

Secretary: H. DEACON, 291, Blackmoorfoot Road, Crosland Moor, Huddersfield.

The Northampton S.M.E.

The society has been reconditioning a 5 in. gauge "Baltic" tank locomotive, which was made by its late President, S. J. Ward, way back in 1921. Unfortunately, there is no oil burner fitted, and we have been unable to get any details. We would be glad to hear from anyone who has had experience of this type of locomotive or from anyone who has had experience of oil burners generally.

The regular features of our past winter programmes will be resumed in October, especially the popular "Bits and pieces" competition and

the quiz, which will be presented this year with variations.

The annual "Ladies Night" will be held on Tuesday, December 14th.

Hon. Secretary: W. A. WELLS, The Guest House, Moulton, Northampton.

Edinburgh S.M.E.

The first of our meetings in the 1954-55 session takes place from October 17th to 30th, when we are showing a group of model and workshop equipment, at the Hobbies and Crafts exhibition sponsored by the Rotary Club and held in the Waverley Market, Edinburgh.

The annual general meeting has had to be postponed to Saturday November 13th at 3 p.m. in the Club Rooms, on Tuesday evening, November 23rd, there will be an "Engineering Film" night at 56, Queen Street, when certain films will be shown for the first time in Scotland.

The workshop and club rooms at 1a, Ramsay Lane, Lawnmarket, Edinburgh are open on Tuesday evenings, from 7.30 p.m. and Saturday afternoon from 3 p.m. and all interested are welcome.

Hon. Secretary: JAMES H. FARR, Wardie Garage, Ferry Road, West, Edinburgh, 5.

The Bristol S.M.E.E.

The following meetings will take place at the Folk House, College Green, Bristol 1, at 7.30 p.m.

Wednesday, October 13th, "Questions and Answers." Members are asked to put their problems (loco, power boat, car, traction, workshop, etc.) to the meeting, and those that consider they can solve them, or answer them on the blackboard, are very earnestly asked to come forward and make this an interesting evening.

Saturday, November 6th, "Bring and Buy Sale." Have you any tools, books, etc., which you no longer need? You may have just what someone else is looking for. Let us sell for you—10 per cent. of the price realised goes to club funds. Mr. Kerswell will again be the auctioneer. Even if you have nothing to sell, an interesting evening is assured and there may be something you would like to buy.

Wednesday, November 24th, "Epidiascope Evening." Will every member bring some pictures please? Anything which will educate, interest (or just amuse) the meeting. Photographs of engineering projects, unusual pieces of equipment or perhaps pictures you yourself have taken of club activities, etc.

Saturday, December 4th, "Annual General Meeting." We would impress on all members the importance of attending the A.G.M. if they have a real interest in the running of the club. It is at this meeting officers and committee are elected, and all members have an opportunity of voicing suggestions about the Society's future policy and programme.

Wednesday, December 22nd, "Free and Easy Night." It is felt that members will welcome this opportunity for informal discussion and for seeing what their fellow members are making. If you have any work in progress which is of convenient size for transport please bring it along.

The club have been invited to spend an evening with the Bristol Railway Circle at their club rooms in Tyndall's Park Road, November 27th, 7 p.m.

Hon. Secretary: W. E. ROUND, 14, Britannia Road, Kingswood, Bristol.

The Junior Institution of Engineers

Friday, October 8th, at 7 p.m., Pepys House, 14, Rochester Row, S.W.1. Ordinary meeting: Paper, "Oxygen Breathing Apparatus with Special Reference to Everest, 1953," by P. W. Fitt (Normair Ltd, Yeovil).

Sheffield and District Section: Monday, October 11th, at 7.30 p.m., at Livesey Clegg House (opposite Union Street Cinema), Sheffield. Annual General Meeting and Chairman's Address. "Furnace Construction," by F. Goldsbrough (Member).

THE MODEL ENGINEER'S DIARY

October 11th to 23rd inclusive.—Tyne-side Society of Model and Experimental Engineers.—Exhibition at The Chronicle Hall, Newcastle-upon-Tyne.

October 19th, 20th, 21st, 22nd and 23rd.—Grimsby & District Society of Model and Experimental Engineers.—Bi-annual exhibition at the St. Aidans Church Hall, Grimsby.

October 21st, 22nd and 23rd.—Chester Model Railway Club.—Exhibition at the Town Hall, Chester.

October 27th, 28th, 29th, 30th.—Trowbridge and District Society of Model Engineers.—Annual exhibition at St. James' Hall, Union St., Trowbridge. Open from 10 a.m. to 10 p.m. daily.

CONDITIONS OF SALE

This periodical is sold subject to the following conditions, namely, that it shall not, without the written permission of the publishers first given, be lent, resold, hired-out or otherwise disposed of by way of trade except at the full retail price of 9d., and that it shall not be lent, resold, hired-out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of trade; or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.

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The Managing Editor invites correspondence and original contributions on all small power engineering and electrical subjects. Correspondence and manuscripts should not be addressed to individuals, but to the Managing Editor, THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

SUBSCRIPTION RATE

The Annual Subscription is £2 2s. 0d, six months £1 1s. 0d., post free, to all parts of the world.



The locomotive seen in this photograph was built by Mr. R. E. Ellis, a toolmaker of Newton, Chester, and is undoubtedly a very fine example of "Hielan' Lassie". Mr. Ellis informs us that he has now replaced the double chimney by a single one, resulting in much better performance

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WORKSHOP EQUIPMENT

Buck & Ryan for Lathes and Accessories, drilling machines, grinders, electric tools, surface plates, etc.—310-312, Euston Road, London, N.W.1. Phone Euston 4661.

New (Slightly Soiled) 2½" 3-jaw (reversible) scroll chucks (model 32) Burnerd, reduced from £5 8s. to £3 10s. (1s. 9d. p. and p.). List supplied on request.—**JOHN MORRIS (CLERKENWELL) LTD.,** 64, Clerkenwell Road, E.C.1.

Rebuilt Lathes. The Acorn Machine Tool Co. (1936) Ltd., offer rebuild to limits "Acorn tools" and "Atlas" 10" swing s.s. available. Write—610-614, Chiswick High Road, W.4. (Phone: CHI 3416).

G. P. Potts, Ruthin Road, Denbigh. Milling, grinding, saw table attachments, turrets also castings drill grinding jigs, collets, B.A. screws, bolts and nuts. Lists 6d.

"Impetus" machines, wood planers motorised, drills, belt sanders, electric motors, paint sprays, air compressors, circular saws, etc. Catalogue.—**JOHN STEEL,** Castlefields, Bingley.

The 2½" x 10" E.W. Lathe. Unrivalled in its class. Plain lathe £13 4s. Fully convertible to back gear and screwcutting. Can be obtained on the easiest of terms from 5s. weekly. Send s.a.c. for details. Adopt lathes, shapers, Perfecto shapers, British blow lamps. No interest, no fuss credit terms. Details s.a.c.—**WANSTEAD SUPPLY CO.,** 48, High Street, London, E.11.

The Acorn Machine Tool Co. (1936) Ltd. are in a position to undertake the complete rebuilding of Atlas, Acorn tools, Sphere and Halifax lathes, or if preferred, we can supply any spare parts that may be required for these machines. Full range of accessories and equipment for all these machines also available. Generous allowance given on old machines against the supply of new "Acorn" lathes. Second-hand machines of Atlas and Acorn tools manufacture, rebuilt by us available from £75 each.—Write to—610-614, Chiswick High Road, W.4. Tel: Chiswick 3416-7-8-9.

£48. 5" SC Act Lathe, countershaft, ½ h.p., s.p., 50 c. motor.—**LIDDLE,** 64, Wansford Road, Woodford Green, Essex. BUC 5210.

Holtzappel Ornamental Turning Lathe with much equipment including eccentric, oval, spherical, cycloidal and rectilinear chucks in cabinet, £60.—**Box No. 7451, MODEL ENGINEER OFFICES.**

High Speed M.T.S. Reamers ¾", 7/32", 15/64", ¼", 4 for 12s.; 15 ass. hand reamers all different up to ¾", 25s. All new in makers' wrappings. Post 1s. extra.—ATFIELD,** 221, Green Lane, London, S.E.9.**

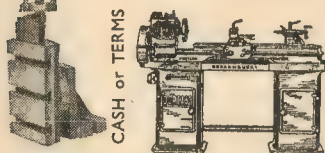
Evans Ornamental Turning Lathe, No. 1291. Good condition motorised, all accessories, numerous tools. Offers.—**Box No. 7462, MODEL ENGINEER OFFICES.**

New 2½" E.W. Lathe, chucks, faceplate, gears, boring table, motor, c/shaft, tools, (cost £37), £30 o.n.o.—**Batt. 5882.**

"Benson" 10" Vernier Caliper as new, only used few times, £7. "Myford" swivelling vertical slide, unused, £3.—**E. W. OLLEY,** Pumping Station, Henham, Bishops Stortford.

CHARLES PORTASS & SON

Dept. M.E., Buttermere Works
Sheffield 8



Myford "M.L.7" 3½" lathe, 6" 4-jaw chuck, 1/3 h.p., 230-250 V motor, with standard equipment, new 1953, chucks, vice, bench, good selection tools, many extras, £60.—230, Iron Mill Lane, Crayford, Kent.

Drummond 3½" Lathe, maker's stand, treadle, countershaft, overhead milling drive, ½ h.p., 230 V a.c. motor, £20. Buyer collects. Dorking district.—**Box No. 7463, MODEL ENGINEER OFFICES.**

6" x 18" B.G.S.C. Lathe, chip tray, stand, compound rest, two faceplates, 3-jaw independent and s.c. chuck, tailstock chuck 0-¼", handrest arbor with two milling cutters, £20. Motor ½ h.p., 1,425 single-phase, £6.—**BREWER,** Milton, Badgers Mount, Sevenoaks.

Contents of Model Engineer's Workshop for sale, including "Myford" 3½" B.G.S.C. lathe, full equipment and tools, owner vacating house for small flat, bargain prices. S.A.E. for list, Harrow district, buyer collects.—**Box No. 7464, MODEL ENGINEER OFFICES.**

3½" Zyto, c/s B.G.S.C. 3-jaw, 4-jaw tailstock chucks, accessories, stand, nearly new, £26. Phone: **BUCKHURST 7686**—23, Derby Road, E.18.

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Atlas 5 x 24" Centre Lathe, motorised, excellent condition, all standard accessories, plus three chucks, American toolpost, boring table, micrometrical stop, 4-way toolpost, etc., accessories, mostly new, £109, other tools. S.A.E. details.—**SYNER,** 73, Sherbrooke Road, London, S.W.6.

Sale. E.W. Motorised Lathe, 2½ B.G.S.C. on baseboard, with chucks, v.s. and many accessories. Excellent condition, ready for use, £28. Adana No. 2 printing press, accessories and 17 type founts, cost £35, hardly used, £18. Must sell. S.A.E.—**66, Raglan Street, St. Helens, Lancs.**

3½" Screwcutting Tizack Zyto Lathe on stand, motorised. Also small power drilling machine.—**24, Coningsley Road, High Wycombe.**

4" Drummond R.B. S.C. Lathe, on treadle stand. 3" s.c. chuck, 4" Independent 4-jaw chuck, accessories, £30.—**Box No. 7465, MODEL ENGINEER OFFICES.**

ROGERS

31, NELSON STREET,
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Compressors. Twin Cylinder, ex. W.D. ready for use. 12 cu. ft., 200 lb. max. Professional type. Full details on request.

Rotary Files, set of 12 in wood case 11/9
Springs assorted, 50 in box ... 3/-
Thread Gauges 28 arms ... 4/9

Admiralty Rotary Compressor Plants complete, less motor ... £5 7 6

Self Tapping Screws, 100 ass't'd 3/-
Copper Rivets, 12 doz. ass't'd 1/3
Abrasive Discs 5" dia. ass't'd doz. 3/6
Green Grit Wheels 3" x ½" x ½" bore 4/9
Flexible Drives 2' 8" long ... 5/6
Selsyn Motors 3" long ... 5/6

May we send our list of hundreds of interesting items? 1½d. stamp please.

Stuart Sirius Engine, new, unused, £4 10s. Also Starrett 10" vernier caliper gauge with adapter to convert to vernier height gauge, also Starrett 0" to 2" micrometer, £2, or nearest offers.—**F. BROWN,** 27, Peel Road Gosport.

Surface Plate, 10" x 8", hand scraped and M. & W. surface gauge £5, new.—**48, Douglas Avenue, Whitstable.**

Myford "M.L.7" motor, stand, chucks, tools, many extras, £68. Wanted, Midge boiler, cylinders, etc., or 5" loco.—**EGRET,** Rothiemay Road, Flixton, Manchester.

8" Power Shaper with countershaft and ½ h.p. motor, £25. 4½" Milnes screwcutting back-gear treadle lathe, chucks and host of extras, dismantled, £17 10s. 6" Selecta 240 V grinder, as new, £10. ½" motorised Walker Turner bench drill, 240 V, 4 speed, £17 10s. Chesterman vernier height gauge, 14", as new, £12. Jacob's drill chucks, vernier protractor, depth micrometer.—**Bowes Park 1937. 54, Outram Road, N.22.**

2½" Wade Lathe, £9. Vols. 100/108 "M.E." mint condition, £5. Materials, etc.—**130, Avenue Road, W.3.**

5" Plain Lathe lengthened slide-rest, 4-jaw chuck, fast motor, £7. Sundry hand-tools very cheap, apply—**MIDDLETON,** 37 Squirrels Heath Road, Harold Wood, Essex.

MODELS AND FITTINGS

Petrol Engine Castings for Westbury engines, piston rings in small sizes. Send s.a.e. for list.—**CRAFTSMANSHIP MODELS**, 27, Circle Gardens, London, S.W.19.

Stocks of Locomotives from 2½"-10½", gauge.—**MINIATURE TRANSPORTATION LTD.**, 2, The Arcade, Liverpool Street (Met.) Station, E.C.2.

6½" Gauge Coal-fired Loco, 4-4-2 for sale in perfect condition. What offers? Apply—**THE FARMHOUSE**, Point Clear, St. Osyth, Essex. Near Clacton-on-Sea. Phone St. Osyth 311.

Wanted Drawings also castings, etc. ¾" scale L.M.S. 4-6-2 "Princess." Please write price to—**R. J. BAIRD**, 24, Rowe Avenue, Halifax, Nova Scotia, Canada.

Wanted Lowke's Gauge 2 L.N.W.R. clockwork, 4-6-2 tank locomotive, wooden brake van (goods) and 1909 railway catalogue.—**Box No. 7457, MODEL ENGINEER** Offices.

Horizontal Compound Engine, £12, and Vertical Compound, £6 10s., see "M.E." July 29th. Beam engine, see "M.E." June 24th, £15. Horizontal engine 1½" x 3", reversing gear, feed pump and lubricator, £10. Copper vertical boiler 17" x 8", 21-½" tubes, by Dick Simmonds, tested 200 lb., gas fired, £25. 3½" "Royal Scot," engineer built, unpainted, boiler by Simmonds, £65. 1" Micrometer, Moore & Wright, £1 12s. 6d. Starret revolution counter, 15s. 2½" dia. pressure gauge, 12s. 6d. Swivelling vertical slide, for 3½" lathe, £3 17s. 6d. Museum piece, "Little Wanzler" sewing machine, 90 years old, offers.—**"Model Engineers"**, 1946 to 1952, offers.—**HUTCHINGS**, Britannia Road, Sarniton.

"G.N.R. "Ivatt" Atlantic Loco and Tender, Bogie passenger truck, track, sleepers, buffer stops, signal, running order, 6" gauge, £250 or offers.—**Below**.

Pacific Loco Chassis, Baker valve gear, coupling rods, cylinder castings, twin axle pumps, 5" gauge, £17-10s. Offers.—**Below**.

"Showmans" Compound Traction Engine, fancy brass fittings, nice model. 1½" scale, coal fired, £50. Offers.—**ROPER** 91, Westway, London, W.12.

"Royal Scot" 10½" gauge Passenger outfit and three passenger carrying cars. Offers.—**S. BATTISON**, 207, Nottingham Road, Ilkerton.

Model Steam Engine Undertype Cyl: 3½" x 2½", 100/120 p.s.i., approx. 1 h.p., engineer designed and built. Awarded "M.E." medal. Few 'photos available. £35 o.n.o.—**Box No. 7459, MODEL ENGINEER** Offices.

7½" Gauge 4-4-0 Loco and tender chassis, all heavy machining completed and guaranteed with professionally made steel boiler. East Midlands area. Best offer over £40.—**A. C. LAWRENCE**, 25, Exeter Road, Peterborough, Northants.

1 Scale U.S.A. Coal Tender, 8 wheel-bolsters, high class job, £3 10s.—**J. ARTHURS**, New House, Uplowman Cross, Tiverton, Devon.

Wanted. Model steam engine with boiler, undertype preferred. Full details. Inspection Sheffield.—**Box No. 7461, MODEL ENGINEER** Offices.

High Pressure Steam Boiler 2' dia. 3" high, coal fired, needs cleaning externally. Must clear, £5 offer. Write.—**8, Dumbreck Road, Eltham, London**.

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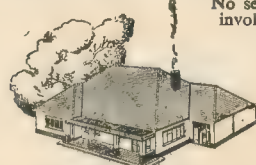
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Wanted. "M.E." July-October, Vol. 37, also No. 1130, Vol. 47.—ADAMS, 5255, Cote Saint Luke Road, Montreal, Canada.

Wanted. Issues "Model Engineer" May 24th, December 20th, 1951, August 20th, 1953.—HURLEY, 180, Southgate Road, London, N.1.

100 Chemicals and Apparatus with set gold-plated weights, suit university student, £12. Radio 100 valves, some unused, boxed, X-ray tube, cathode-ray tube, TV Video unit, 8-valve receiver, all usable, £10 lot.—SHACKLE, Garth House, Brickfields Lane, Harlington, Hayes, Middx.

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Wanted Old-time Books pertaining to Steam Engines.—COUPE, 185, Winchester Road, Basingstoke.

Watch Repairers, Hobbyists, etc. Send s.a.e. for free lists of watches, movements, materials, tools, lathes, etc.—LOADER BROS., Dept. M.E., 36, Milestone Road, Carterton, Oxford.

Wanted. Pittler and G. Adams catalogues. Any Pittler B.2. Parts or accessories.—PEARSON, The White Swan, Widdford, nr. Ware, Herts.

"M.E.'s" Vol's 73-108, unbound 12 copies missing. Offers. S.A.E. for details.—SKINNER, 32, Beech Gardens, Lichfield, Staffs.

Wanted 1951-1952 "M.E.'s"—L. T. Fox, 16, Mansfield Road, Nottingham.

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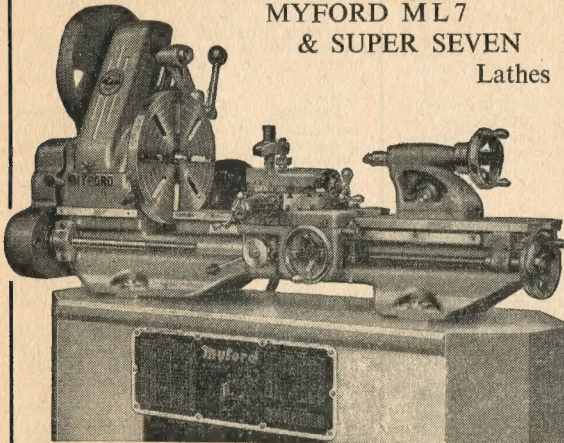
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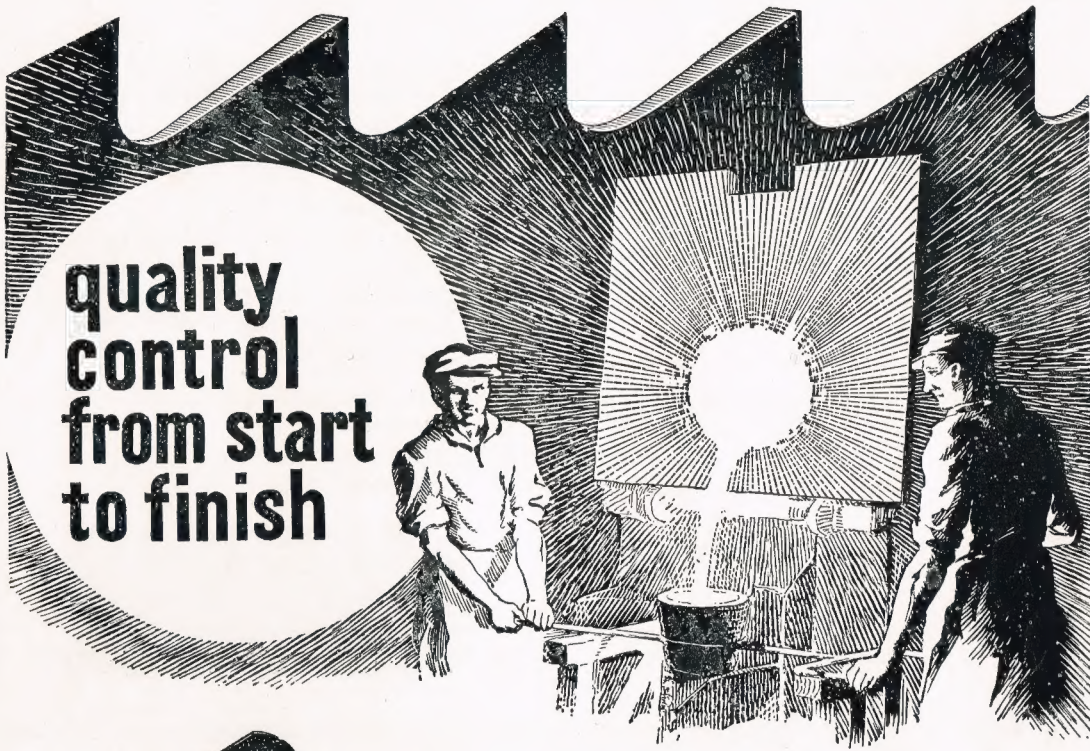
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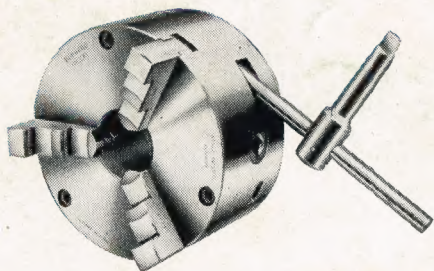
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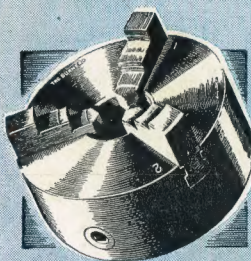
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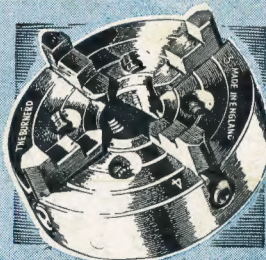
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